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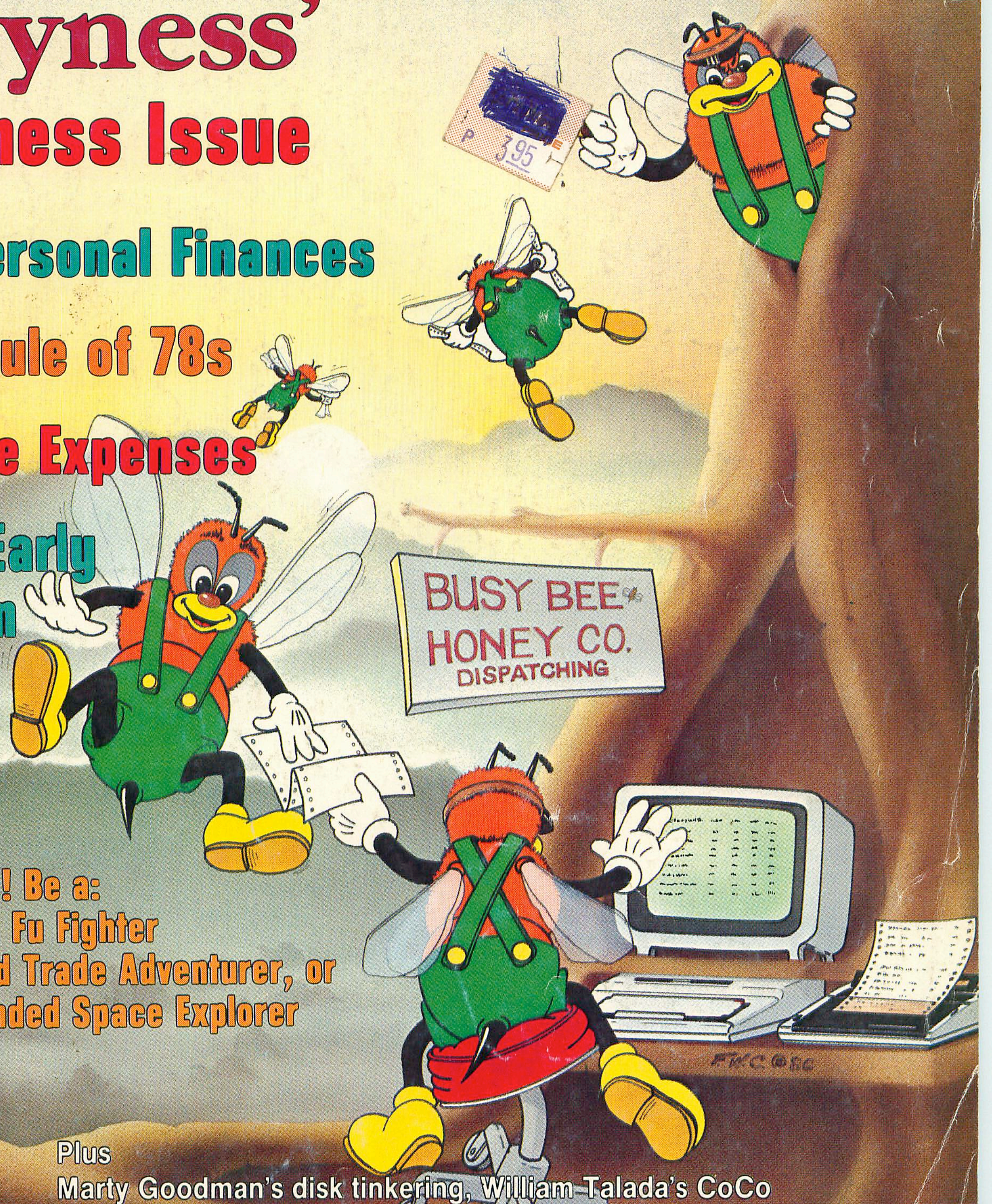

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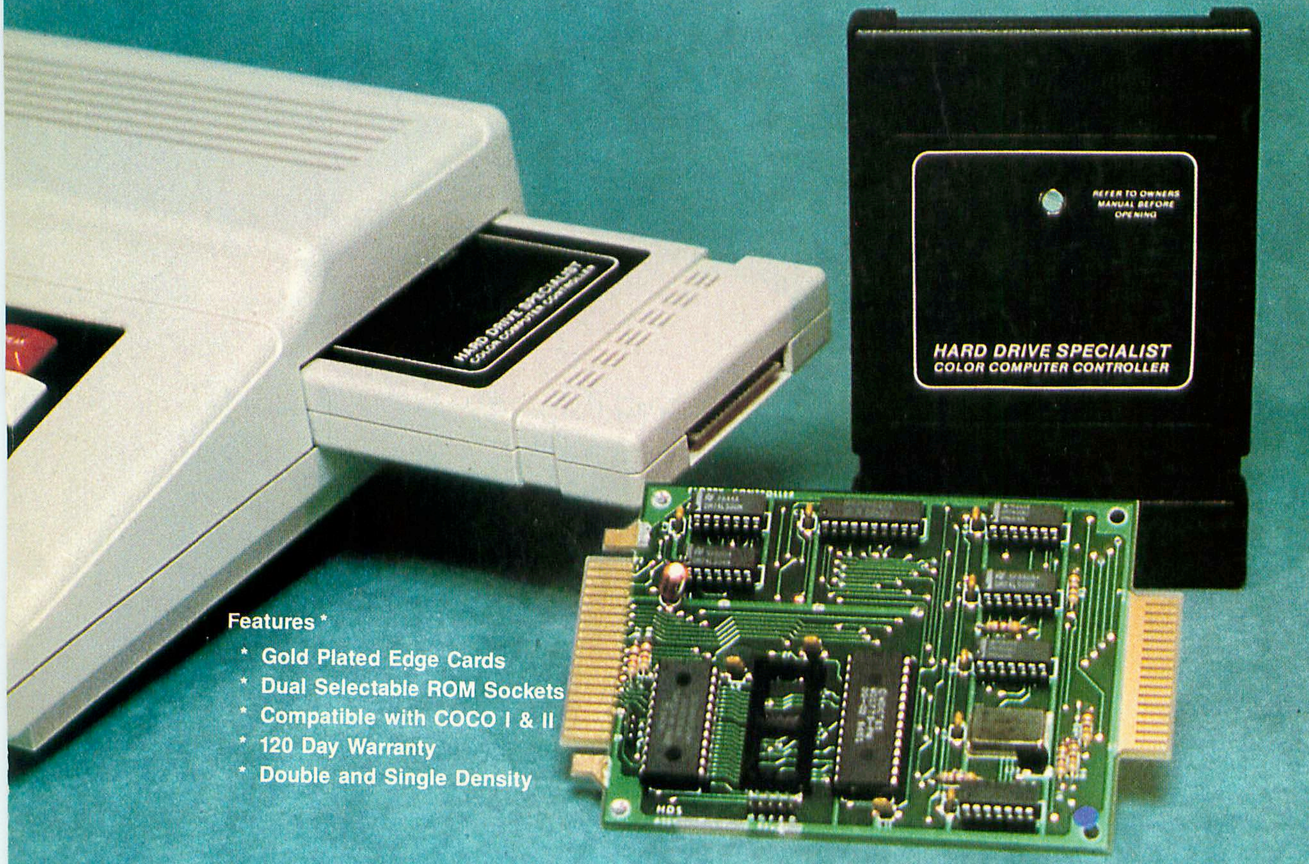
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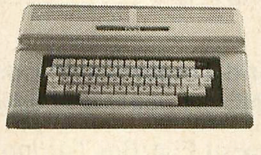

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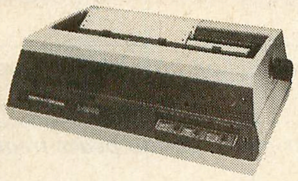

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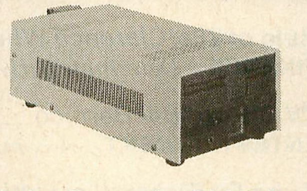

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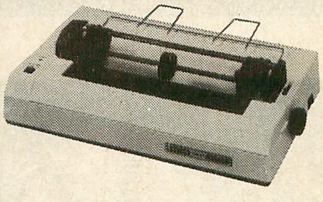

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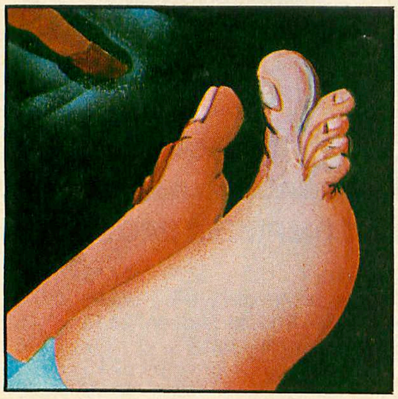
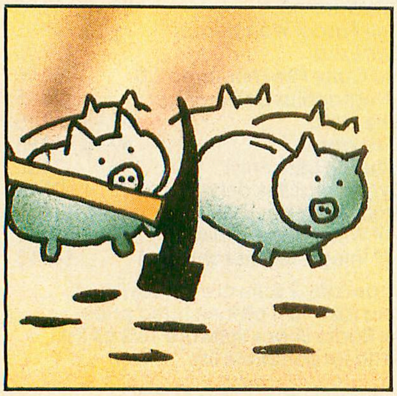
18



26



122

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FEATURES

📼 **World Trader/***David Compton* 18
GAME *A nonviolent adventure of buying and selling*

📼 **Receipt File/***Bill Tottingham* 22
BUSINESS *Print receipts and save to disk for tax purposes*

📼 **Workout/***William Talada* 26
HOME HELP *A 15-minute exercise instruction*

📼 **CoCoflow: CoCocad Expansion/***Dennis Page* 31
PROGRAMMING UTILITY *An aid for drawing flow chart diagrams*

📼 **Rule of 78s/***Clarence Whaley* 36
FINANCE *Determine early pay-off amounts on installment loans*

📼 **TV Shows/***Bill Bernico* 49
ENTERTAINMENT *A computer hacker-couch potato peace treaty*

📼 **Kung Fu Fighter/***Larry Wolcott* 66
GAME *Defend yourself with deadly kicks and punches*

📼 **Cash vs. Financing/***Bill Bernico* 71
FINANCE *The economic advantage*

📼 **Home Budget Analysis/***Glen Dufur* 76
FINANCE *Forecasting personal finances*

📼 **Analyzer/***Martin H. Goodman* 84
DISK UTILITY *Examining disk file structure*

📼 **Varlist/***Hans Schulz* 92
PROGRAMMING UTILITY *An easy way to list program variables*

📼 **Marquee/***Chuck Poynter* 101
PROGRAMMING UTILITY *Put your program up in lights*

📼 **Saucer/***Allen B. Carlisle* 108
GAME *Avoid those flying saucer people*

📼 **Expense Tracking and Management/***Eddie Hill* 122
BUSINESS *Providing budgetary analysis for accounts*

📼 **Mortgage Planner/***Edward R. Carson* 163
FINANCE *The joy$ of early amortizaton*

📼 The small cassette tape symbols beside features and regular columns indicate that the program listings with those articles are on this month's RAINBOW ON TAPE, ready to CLOAD and RUN. For full details, check our RAINBOW ON TAPE ad on Page 230.

NEXT MONTH: As spring commences, April is the perfect month to plant our new Home Help issue. We'll shower you with programs to accommodate the home and its activities. And, if that's not enough to get your feet wet, we'll also reveal the two grand-prize winning programs of our Third Annual Adventure Contest and announce the names of the remaining winning entries.

Look to THE RAINBOW to make your "home sweet home" with the best articles, programs and product reviews for your Color Computer.

COLUMNS

BASIC Training/*Joseph Kolar* 39
A simple technique for creating animation

Building March's Rainbow/*Jim Reed* 16
Managing Editor's comments

Delphi Bureau/*John R. Curl* 210
New forum commands

Earth to Ed/*Ed Ellers* 116
Beam up those "tech" questions

Education Notes/*Steve Blyn* 152
Building language arts skills

Education Overview/*Michael Plog, Ph.D.* 154
Educating with electronic communications and research

PRINT#-2,/*Tamara Dunn* 12
Your CoCo: An investment for easing the high-tech pace

Turn of the Screw/*Tony DiStefano* 62
An introduction to timing

Wishing Well/*Fred Scerbo* 157
Creating Hi-Res graphics title screens

DEPARTMENTS

Advertiser Index 256
Back Issue Information 207
CoCo Cat 240
CoCo Gallery 114
Corrections 191
Letters to Rainbow 6
One-Liner Contest Information 238
The Pipeline 104
Rainbow Info 120
Received and Certified 180
Scoreboard 174
Scoreboard Pointers 176
Submitting Material to Rainbow 199
Subscription Information 65
These Fine Stores 254

RAINBOWTECH

Accessible Applications/*Richard White* 226
Firing up BASIC09

Barden's Buffer/*William Barden, Jr.* 237
Listening with assembly language

Downloads/*Dan Downard* 214
Answers to your technical questions

The Utility Room/*Brian A. Lantz* 216
Errors, error messages and error conditions

"KISSable OS-9" will return next month.

PRODUCT REVIEWS

Product Review Contents 179

The RAINBOW
March 1986 Vol. V No. 8

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LETTERS TO THE RAINBOW

Is CoCo Involved?

Editor:

There has been a burning question that I have had for quite some time and have never seen it asked in the "Letters to Rainbow" section. I've always wanted to know exactly how much is the CoCo involved in the production, publishing, editing and writing of THE RAINBOW?

Also, I have seen many explanations on how to make my CoCo I handle a fast POKE, but I have never been able to find it on my board (I'm referring to C85). Where is this hidden wonder? I own an 'F' board.

Steve Haughey
Whitefish Bay, WI

Editor's Note: Most of our contributors use CoCos, not only for programming, but the write-ups as well. We use the CoCo here to print out listings and to load articles done on CoCo word processors and transfer them to our typesetting machines. Plus, many "*in-house*" columns such as "Building a Rainbow," "Earth to Ed" and "Downloads" are composed on the CoCo. An average issue probably involves more than a hundred different Color Computers when you consider reviewers and even writers to this Letters column also use the CoCo.

While your board may be capable of using the high speed POKE without any modification whatsoever, depending on the condition of your chips, if you need to clip capacitors, the ones to clip on the 'D' and 'E' boards are the C73, C75 and C85 (the latter is located near the internal ROM Pak connector). For the 'F' Board (also called the TDP, ET and NC) clip one side of C36, C37 and C30. You see, they renumbered the capacitors on the 'F' board.

CoCo-VCR Connection

Editor:

I am interested in hooking my CoCo to my VCR for titling and animation. Will articles of this nature be found in the new *VCR* magazine or would they be shown in THE RAINBOW?

John H. Carstens
Toms River, NJ

Editor's Note: Our new *VCR* magazine places the emphasis on entertainment and will have little, if any, hardware material. So, keep reading THE RAINBOW for this sort of thing.

BACK TALK

Editor:

In the July 1985 issue [Page 8], I read the letter from Tim Jay of St. Petersburg, Florida. He was wondering if a universal program for the different types of computers existed.

In the Netherlands, the National Broadcasting Station (NOS) broadcasted programs for four types of computers a long time ago. Then more and more computers became popular and they were not able to broadcast general interest programs for each type. After some thinking, they found a solution. They invented a universal language that uses commands available for each computer — no matter what type BASIC they use. They called it *BASICODE.* It consists of two programs: a BASIC file to make it possible for each computer to use the same BASIC statements, and an ML routine to save the program in a "universal way" on tape.

This means it is possible to transfer BASIC programs to another computer by the use of the ML routine. If this BASIC program is not written in the *BASICODE* protocol, you have to convert the different statements to your BASIC version.

If you are interested in the *BASICODE* program, please write me at Eikenlaan 1, 4641 GB Ossendrecht, the Netherlands. The program is written for many computers such as IBM, Models 1 and 3, Commodore, Spectrum, MSX and the CoCo.

Please continue with your excellent magazine. It is our only source for information on the Color Computer.

Jorgen te Giffel
the Netherlands

We Stand Corrected

Editor:

I noticed the letter in the December 1985 issue [Page 9], by Greg Garnett. You said to change 90 and 100 to:

```
90 C$=C$+".bas"
100 RUN C$
```

It should read:

```
90 C$=C$+".bas"
100 RUN ""+C$
```

If you don't include the quotation marks BASIC will think it is a line number and print a UL error. I hope this is helpful to other CoCo fanatics out there.

Ezra Story
Woodstock, NY

Editor:

I am writing in response to Greg Garnett's letter [December 1985, Page 9]. This program will do exactly what he wants to do and with fewer lines. I have been using this as a hello program now for some time and found it to work nicely. I tried the program listed with the corrections that you suggested. I found that the changes will not work with Disk BASIC.

```
 5 CLS
 10 PRINT"HELLO"
 40 DIR(0)
 50 PRINT"PLEASE ENTER THE NAME OF
    PROGRAM TO RUN"
 60 INPUT C$
 70 C$S=C$+"/BAS"
 80 LOAD C$,R
```

Clay Smith
Williamstown, NJ

Editor:

Thanks to Mike Sweet and THE RAINBOW for the "Cheap Keyboard," December 1985, Page 208 for the Deluxe Keyboard. I got one of the last ones in Boston. Instead of bending the pins, which can damage the board, I bought a 34-pin Header Connector (Radio Shack No. 276-1529) for $3.19. Place the ribbon connector, backed up by a thin strip of plastic, between the two rows of contacts at the rear of the plug. Pull a stretched-tight rubber band between the cable and the plastic strip; as it shrinks in length it expands in thickness, pressing the conductors against one bank of contacts. Now let's have some articles or tips on the Deluxe Keyboard. Please keep up the experimental do-it-yourself approach.

Alfred Rubio
Somerville, MA

Editor:

I'd like to respond to a letter I saw in your January 1986 issue [Page 8]. Haskell Brodek asked about tape to disk transfer programs. One word of warning. If you use such a program and that program automatically transfers the tape program to disk using the tape-saved name, you could be in for some problems. It doesn't happen very often, but when it does, it causes some extra work for the user.

I'm talking about tape-saved programs that use an extension as part of the title Several good examples are found on the January 1986 issue of RAINBOW ON TAPE. These include `SCF/EDI`, `SMF/EDI`, `SUL/EDI` and `SMP/EDI`. There was also one on the December 1983 issue called `D/BAS`.

When automatically transferred from tape to disk, the directory ends up looking like this:

```
SCF/EDI   /BAS 0 B 3
SMF/EDI   /BAS 0 B 4
SUL/EDI   /BAS 0 B 4
SUL/EDI   /BAS 0 B 2
```

Since disk programs can't have two extensions, once it's transferred to disk, you'll never get it back off again. You'll have to do a `DSKINI0` and start over. You can't even kill one of these programs. Your best bet is to use Roger Schrag's "A Tape to Disk Transfer Vehicle" [Page 48], a transfer program from the January 1984 issue. It allows you to give the disk-saved program any name you like. I hope this saves someone some undue frustration.

I'll be attending RAINBOWfest in Chicago on Sunday, May 25. I hope to meet some of my pen pals or anyone else interested in "talking shop." See you there.

Bill Bernico
Sheboygan, W

Handbook Requested

Editor:

I would like to get the Delphi Handbook and command card. The advertisement says I can order it while online, but how can I order it without knowing the command to do it?

I also await the next Simulations issue. I enjoy it when you put the top winners' programs in THE RAINBOW. Also, looking at the back issue order form, I see you haven't had an Adventure issue. And, if you follow through with P. Giodano's idea of a "Best Of" issue ("Letters to Rainbow", Page 8), I think it would be nice to include all programs that won first prize in all of your contests.

Brandon Rhodes
Andover, MA

Editor's Note: There are two ways to order the Delphi Handbook. If you haven't already signed up on Delphi, when you do so you'll be asked whether or not you want to buy the package. If you've already signed up, you can order the Delphi Handbook by sending a mail message to SERVICE. Either way, the cost will be billed to your Delphi account. Any questions you might have should be directed to Delphi Customer Service; their toll-free number is (800) 544-4005.

Winners of the Third Annual Adventure Contest will be announced in the April 1986 issue. February 1984 was our latest Adventure issue.

HINTS AND TIPS

Editor:

I found a flaw in the program *Christmas Songs* (December 1985, Page 36). You can barely hear the music, even if you have the TV volume turned all the way up. The following line eliminates this problem and the other problem of the screen turning pink after you run the program.

```
225 POKE65315,230
```

Roy Geeo
Hot Springs, AR

Editor:

I recently purchased a used MC-10 and was making backup copies of the programs I received with it. When it came to backing up the machine language tapes, there was no `CSAVEM` command. I discovered that if you `CLOADM` an MC-10 machine language tape on a CoCo 2 64K, you could `PEEK` the necessary locations to find the start, end and exec addresses and `CSAVEM` to tape. Then you have a backup and can run it on the MC-10 as you would any other machine language tape.

Kevin Schmidt
Arkdale, WI

Automatic Hangup

Editor:

For those who use the Radio Shack Modem II, I have a command that will hang up the modem automatically. This comes in handy if you are into running a BBS. This command is `POKE &HFF20,0`. If you use this with a remote driver you will have to put a `FOR X=1TO2000:NEXT` command right after the poke.

Timothy Doktorski
Jersey City, NJ

Editor:

Here is another possible solution to the cassette motor drive problem. I overcame the problem by adding a push-button switch to the cassette recorder. This will bypass the mike jack that controls the cassette drive motor. In order to be able to hear the tape, I added a 2200 ohm resistor across the ear jack. I can then hear the tape when the volumn is up all the way, but it is not loud enough to be bothersome.

To find the points to connect to, use an ohmmeter. When an open cable is plugged into the cassette jack, the contacts will open up. These are where you solder your wires.

Denis Santerre
E. Holden, ME

Editor:

I recently purchased a Royal Beta 8100 typewriter with an IF600 adapter box and a Color Computer adapter cable. Initially, I was unable to get the typewriter to print using either `PRINT#-2, " "` or through my *Telewriter-64*. After quite a bit of experimentation with the switch block in the adapter box, I was able to get the typewriter to print by setting the switches to get the following status, obtained by interrogating the interface box:

STATUS
PROM designation: EFFC 03-01
Date: 12/10/84
Interface: V24 (RS 232 C)
Baud rate: 600
Data format: 8 bit
Parity: off
Protocol: DC1/DC3
Control line: DTR
DSR: off
Auto LF: on
Auto CR: on
Select In: off
Form length: 60
Character set: US2

This may be of use to someone else having the same problem.

Jon Buchanan
Troy, IL

Biblical Books

Editor:

As a pastor, I use my CoCo quite extensively for word processing and utilize the capabilities of *Telewriter-64* to the fullest. I have written two books and numerous sermons and have found the CoCo more than adequate. I would like to let anyone who may be interested to know that copies of the two books are available on disk. Book one is entitled *An Introduction to the Doctrines of Grace* and is on one disk. Book two is entitled *Portraits of Christ: As Painted in John's Gospel* and is on two full disks. All disks are in *Telewriter* binary format. Anyone wishing copies should send three blank disks and a return mailer with postage affixed to 221 Highview Drive, 63011.

The material is copyrighted, but those who receive the disks may feel free to use it as they wish. Donations for the material would be appreciated, but I will gladly provide copies for anyone who wishes to have them.

Lastly, my thanks to THE RAINBOW staff for a great magazine. I would like to suggest that an article be written on how people are using the CoCo in various ministry activities.

Pastor Mark Camp
Ballwin, MO

REQUEST HOTLINE

Editor:

I would like to know if anyone has software that emulates a VT-100 Digital Equipment Corp. CRT. If so, please write to me at 2410 Imperial Oaks, 52761.

Joe Barnard
Muscatine, IA

Editor:

I would like to be in contact with someone who has interfaced a Digital LA36 Decwriter II with a Radio Shack Extended BASIC computer. I have a Decwriter with no interfaces. I need the wiring drawings and directions. Please contact me at 114 Kenneth Drive, 15626.

William A. Walker
Delmont, PA

In a Screen Print Pinch

Editor:

My teacher and I have been conducting a computer course at our school for three years. We were doing fine until someone took our screen print program last summer. Thus, we had to buy another only to discover that Radio Shack has discontinued the model we previously used. The replacement we found is too slow, which increases printing time.

Does anyone know where we can get the older model or a faster screen print program for the Tandy DMP-130? The older Cat. No. is 26-3021 and the new model's Cat. No. is 26-3121. Write to us at Connersville Junior High School, 1900 Grand Avenue, 47331.

Mike Cramer and Gary Keegan
Connersville, IN

Lie Detector

Editor:

I need help. My math teacher challenged me to build a CoCo lie detector. I have no idea where to start. I would appreciate any help. If possible, I would like it to use a finger clip. My address is 2833 Jackson Pike, 45103.

Chris Schneider
Batavia, OH

Jogger's Log

Editor:

I am looking for a program that will let me combine my hobbies of running and computering. I need a way to keep track of mileage, etc., in a type of training diary.

I have seen a few programs commercially available for some other computers (Apple, IBM, etc.), but I haven't found anything for the CoCo. Anyone knowing of one can write me at 101 Fourth Avenue, 25701.

Steve Clark
Huntington, WV

Editor:

I would like to have a program to log Ham Radio contacts listing calls, names, dates, states and countries. If anyone has a program, please contact me. I am a Ham and would like to keep all my logging contacts on my CoCo. I would also like to see more programs for the Ham. Write to me at 6429 Main Street, 54410. I have 64K ECB and cassette. Also, I would like to hear from someone who has a code program of some kind.

Kim G. Smrstick
Arpin, WI

Editor's Note: See "CoCo's Quick Station Log" on Page 44 of the November 1985 issue.

OS-9 Testimonial

Editor:

RAINBOW is the flip side of "whenever things cannot possibly get any worse, they will." Every time I start thinking you guys have peaked out, you pull another handkerchief out of your sleeve. Congratulations on Brian Lantz's articles. Now we have Dale Puckett, who covers the whole OS-9 spectrum, and Mr. Lantz, who concentrates on programming. What more could we ask for?

Well, for one thing, how about BASIC09 programs along the lines of such classics as *Roach, Surface, Keybomber* and anything by Fred Scerbo? Let's shake the notion that OS-9 is an inherently serious, business applications system. Just what did y'all have in mind when you bought those Color Computers, anyway? OS-9 has some outstanding Hi-Res graphics routines. Let's see them put to use.

Fred Sawtelle
Huntsville, TX

INFORMATION PLEASE

Editor:

Is there any way to save programs downloaded with the Radio Shack RS-232 Program Pak to disk using the Multi-Pak Interface? Any help would be greatly appreciated. You can write me at 622 Perdido Drive, 75043.

Eric Hedstrom
Garland, TX

Editor:

I am desperately looking for a FORTRAN compiler for CoCo. If you know of one, please let me know. I would be appreciative. Write me at 2300 Olinville Avenue, 10467.

Benjamin M. Fine
Bronx, NY

Editor:

At this time, I am considering purchasing a Radio Shack Ink-Jet Printer CGP-220 to go with my CoCo 2 computer. However, I am concerned about being able to use it to print out all of the graphics I have accumulated using the graphics program from the article entitled "The Art of Joystick Painting," by Brian Preble, on Page 97 of the October 1984 issue. I very much like Brian's program and would like to be able to use the CGP-220 printer in making hard copies of all the graphics I have saved on tape. I do understand that the printer comes with a special screen print utility, but I question whether or not this utility works with Brian's program. If anybody can help me, I would greatly appreciate it. My mailing address is P.O. Box 71, 04957.

Chet Lonnquist
Norridgewock, ME

Editor:

Soon after I bought our Epson RX-80 F/T the LX-80 with near letter-quality printing came out. Does anyone know if: a) the printer can be modified; b) any software exists that would do the job for me? I have both *Elite Word* and *VIP Writer.*

Also, does anyone know why some of my printer lines are occasionally wavy? Sometimes the 'a' line will not be quite straight with respect to the others. My address is 2330 Lakeland Avenue, 53704.

Paul Whiting
Madison, WI

Editor:

I am a proud owner of a 64K ECB CoCo with an FD 500 disk drive and a DCM-3 modem. I have a communication program called *Autoterm* that takes close to five minutes to load in on cassette. I want to copy this from tape to disk. It would be a lot faster and I don't want to buy the same program again. This program is machine language and self-executing. Would Radio Shack's *EDTASM+* allow me to do this? How can I do this? My address is RR 3 Box 376, 62966.

Bryon E. Lawrence
Murphysboro, IL

Editor's Note: Read "A Tape To Disk Transfer Vehicle" by Roger Schrag, January 1984, Page 48.

Radio Shack's Color Computer 2®

SAVE ON OUR BEST!

64K Memory! Extended BASIC! Cut $20...new low price $199.95

The Color Computer 2 is an affordable computer that allows you to write programs tailored to your personal and household needs. It's ideal for small-business and professional uses alike. With the built-in Extended BASIC language, you can access 32,000 characters of memory. To access the full 64K memory, simply add a disk drive and the optional OS-9 disk operating system.

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Ready-to-run software can help you set up personal and household budgets, create a household inventory, keep track of your investments, write letters and reports and record recipes.

With a wide range of educational software available, your children can use the Color Computer 2 to help strengthen their math, spelling and reading skills. The family can even play exciting computer games. The system attaches to any TV and is easily expanded.

Get the Color Computer 2 and your family will immediately start to enjoy the advantages of home computing . . . together!

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A CoColess CoCo Fan

Editor:

Here's one Atari user who also wishes he had a CoCo. My respect to RAINBOW, Radio Shack and the users for upholding such an excellent computer.

I am an electronics fanatic and a 6502 expert in most cases. I would like to trade ideas with CoCo users on electronics projects, and would like any type of 6809 assembly listing. I want to convert these for the Atari. My address is 2404 Phoenix Hill Drive, 40207.

Jay Yepuri
Louisville, KY

Teaming up for Adventure

Editor:

Is there anyone out there who has a good Adventure idea (scenario), but can't put it in a program?

I have enough knowledge in BASIC to write a program, but lack ideas. Please send a detailed explanation of your idea, and together we'll produce a great Adventure. My address is 939 S. Harriet, 46151.

Jim Cockrum
Martinsville, IN

KUDOS

Editor:

I am writing this letter in the hopes of delivering some well-deserved kudos. The first I would like to extend to Colorware for their *CoCo Max* program. This has to be, without a doubt, the most user-friendly program I have acquired to date. As a programmer I am intrigued by the concepts utilized, and as a user I can finally let my creative juices flow. It is well worth the money and I highly recommend it to anyone, no matter how remote the need.

The second kudos is to your magazine. With all the "computer envy" these days, all I have to do is let my friends thumb through the pages of your magazine and the discussion is all but over. Keep up the good work.

SM1 Jay Hebert
USS Midway CV 41
Yokosuka, Japan

Editor:

I wish to compliment you on the wonderful magazine you produce. There are many advertisers in THE RAINBOW and it's nice to know there are people other than Radio Shack who support the TRS-80 Color Computer. When I purchased the October 1985 Graphics issue, I saw the usual games, reviews, RAINBOW Scoreboard, etc. What surprised me was the extra long "CoCo Gallery." It was a wonderful idea. I hope it will continue.

Joseph Pendell
Riverside, MD

Newsletters

Editor:

I would like to announce the *CoCo Newsletter.* The newsletter includes helpful `POKE`s, tips for solving Adventures, an occasional review on a new product and one or two programs. The newsletter is available to anyone worldwide. For more information write to me at Rt. 6, Box 293, 26505, or call (304) 594-2791.

Doug Wilburn
Morgantown, WV

Editor:

The MC-10 Newsletter has grown from four pages to 10 pages, and we hope to someday produce a small magazine for the MC-10 computer. Since $6 a year [for dues] is sort of a tight budget to get a magazine started, we must raise our dues, which include subscription, to $12. Anyone wishing information on our club, please write to me at 4730 Cass Street, 92109.

Jose J. Bray
San Diego, CA

Editor:

I would like to tell THE RAINBOW readers about our newsletter. It is called *Alternate Views.* Although its main theme is science fiction, we cover a variety of topics, including computers (the CoCo, of course). For a sample issue and subscription information send 50 cents to 3735 Stark Street, 43906. The editor is John Redpath.

Dale Roman
Bellaire, OH

BOUQUETS

Editor:

I would like everyone to know about two companies who advertise in THE RAINBOW. Never in my life have I been treated with such wonderful service and concern. Special thanks to Sugar Software and Don Dunlop. Also, my compliments to Computer Plus. I can't say enough about these people who put service and customer satisfaction above everything else.

Thanks for a fine publication.

Anthony J. Michael
Bryant, WI

Editor:

I would like to express my thanks to Colorware, Inc. When I ordered *CoCo Max,* I received it in less than two days! I live in a very remote town and seven-day packages are not uncommon. Also, the package was tested and sealed, which shows individual service. Beware — never hit SHIFT-left arrow while a menu is on the screen; doing so will wreck your picture.

Troy Curtiss
Circle, MT

Editor:

I would like everyone to know about two companies who advertise in RAINBOW. Never, in all my life, have I been treated with such wonderful service and concern. Special thanks to Sugar Software and Don Dunlop. Also, my compliments to Computer Plus. I can't say enough about these people, who put service and customer satisfaction above everything else.

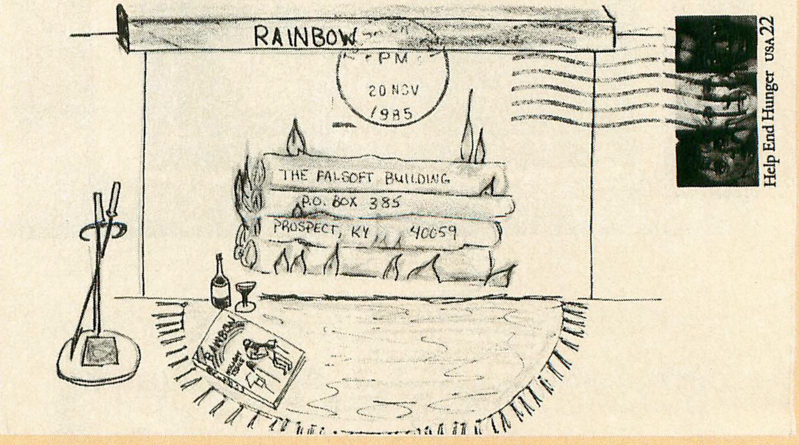
Thanks for a fine publication.

Anthony J. Michael
Bryant, WI

THE RAINBOW welcomes letters to the editors. Mail should be addressed to: Letters to Rainbow, The Falsoft Building, P.O. Box 385, Prospect, KY 40059. Letters should include the writer's full name and address. Letters may be edited for purposes of clarity or space.

Letters to the editor may also be sent to us through the MAIL section of our new Delphi CoCo SIG. From the CoCo SIG> prompt, pick MAIL, then type `SEND` and address to: `EDITORS`.

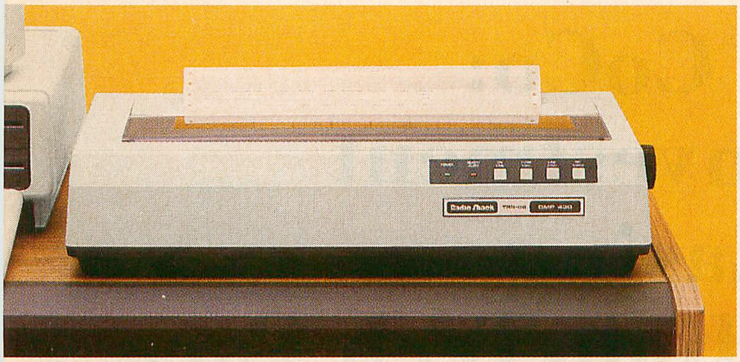
ARTS AND LETTERS

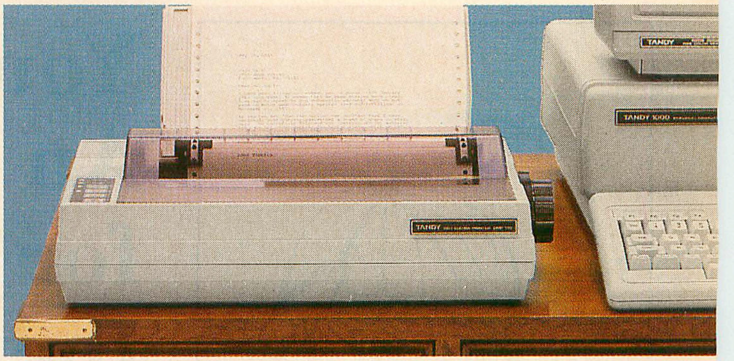


Envelope of the Month

Tom Perrigo
Pawhuska, OK

Next to your computer,





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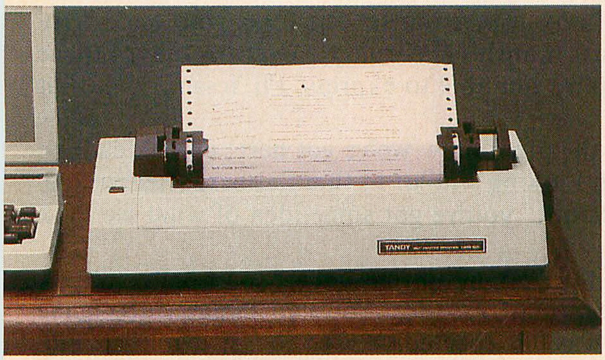

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POWER

Tandy printers make fine print quality, graphics and high performance affordable.

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Low-Cost, Triple-Mode Personal Printer

The DMP 130* (26-1280, $349.95) lets you choose from word processing, data processing and dot-addressable graphics. Prints in four character styles: standard or italic cursive in draft or correspondence modes.

Budget-Priced High Performer

The DMP 105 (26-1276, $199.95) is ideal for data processing and general-purpose use. Features a bit-image graphics mode, too.

High-Resolution Ink-Jet Printer

The CGP 220 (26-1268, $599) quietly prints text and graphics in yellow, violet, red, green, cyan, magenta and black! And because there's no ribbon to wear out or become contaminated, the print quality remains excellent.

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PRINT#-2,

Your CoCo: An Investment for Easing the High-Tech Pace

A gentleman wrote in a few months back suggesting we publish a photograph of the behind-the-scenes people here at RAINBOW who are responsible for its creation each month.

For our curious readers who've aspired to see the folks who make THE RAINBOW, you can refer to last month's (February) cover for one of those faces. With more modesty than I am able to express, I'll 'fess up that that surprised face is mine.

Although I'm only one of the great crew we've got here, come deadline time we're all running around looking similar to that flabbergasted visage. Until we make a "family portrait," you've got some idea of what we look like.

I had advanced notice for the making of that cover, so of course it was all planned and purposely captured on film. You can imagine the same expression appeared when I was unexpectedly asked to write this column. It was deadline week, too.

But I've always welcomed serendipity into my life because it's an excellent way to learn; with that point made, on with the show . . .

Learning is a constant process, an intrinsic part of living that can enrich the quality of our day-to-day existence. Every experience, be it good, bad or indifferent, can serve as a course in enlightenment.

This kind of commitment to growth can be good philosophy in a world that's moving, changing and rearranging more quickly than the average person can keep up with. I believe at the very core of this accelerated pace is computer technology, forming today (before we even know it) the basis for our lifestyles tomorrow.

OK, so this isn't a profound revelation, but this was the rational approach I tried to implement when, over a year and a half ago, I stepped into the CoCo world as a copy editor for THE RAINBOW. Feeling quite inadequate, not to mention intimidated, I had to keep reminding myself of the above stated logic when surrounded by the wonderful (and occasionally frustrating) world of computers.

But, my "techno-fright" soon dissipated when I found the camaraderie that abounded in the CoCo Community, which made my transition into the computer world an easier task.

I'm sure those who have been learning and discovering on their Color Computers can share this same sentiment. You obviously foresee these

Telewriter-64™

the Color Computer Word Processor

- **3 display formats: 51/64/85 columns × 24 lines**
- **True lower case characters**
- **User-friendly full-screen editor**
- **Right justification**
- **Easy hyphenation**
- **Drives any printer**
- **Embedded format and control codes**
- **Runs in 16K, 32K, or 64K**
- **Menu-driven disk and cassette I/O**
- **No hardware modifications required**

THE ORIGINAL

Simply stated, Telewriter is the most powerful word processor you can buy for the TRS-80 Color Computer. The original Telewriter has received rave reviews in every major Color Computer and TRS-80 magazine, as well as enthusiastic praise from thousands of satisfied owners. And rightly so.

The standard Color Computer display of 32 characters by 16 lines without lower case is simply inadequate for serious word processing. The checkerboard letters and tiny lines give you no feel for how your writing looks or reads. Telewriter gives the Color Computer a 51 column by 24 line screen display with *true lower case characters*. So a Telewriter screen looks like a printed page, with a good chunk of text on screen at one time. In fact, more on screen text than you'd get with Apple II, Atari, TI, Vic or TRS-80 Model III.

On top of that, the sophisticated Telewriter full-screen editor is so simple to use, it makes writing fun. With single-letter mnemonic commands, and menu-driven I/O and formatting, Telewriter surpasses all others for user friendliness and pure power.

Telewriter's chain printing feature means that the size of your text is never limited by the amount of memory you have, and Telewriter's advanced cassette handler gives you a powerful word processor without the major additional cost of a disk.

> *...one of the best programs for the Color Computer I have seen...*
>
> — Color Computer News, Jan. 1982

TELEWRITER-64

But now we've added more power to Telewriter. Not just bells and whistles, but major features that give you total control over your writing. We call this new supercharged version Telewriter-64. For two reasons.

64K COMPATIBLE

Telewriter-64 runs fully in any Color Computer — 16K, 32K, or 64K, with or without Extended Basic, with disk or cassette or both. It automatically configures itself to take optimum advantage of all available memory. That means that when you upgrade your memory, the Telewriter-64 text buffer grows accordingly. In a 64K cassette based system, for example, you get about 40K of memory to store text. So you don't need disk or FLEX to put all your 64K to work immediately.

64 COLUMNS (AND 85!)

Besides the original 51 column screen, Telewriter-64 now gives you 2 additional high-density displays: 64 × 24 and 85 × 24!! Both high density modes provide all the standard Telewriter editing capabilities, and you can switch instantly to any of the 3 formats with a single control key command.

The 51 × 24 display is clear and crisp on the screen. The two high density modes are more crowded and less easily readable, but they are perfect for showing you the exact layout of your printed page, *all on the screen at one time*. Compare this with cumbersome "windows" that show you only fragments at a time and don't even allow editing.

RIGHT JUSTIFICATION & HYPHENATION

One outstanding advantage of the full-width screen display is that you can now set the screen width to match the width of your printed page, so that "what you see is what you get." This makes exact alignment of columns possible and it makes hyphenation simple.

Since short lines are the reason for the large spaces often found in standard right justified text, and since hyphenation is the most effective way to eliminate short lines, Telewriter-64 can now promise you some of the best looking right justification you can get on the Color Computer.

FEATURES & SPECIFICATIONS:

Printing and formatting: Drives any printer (LPVII/VIII, DMP-100/200, Epson, Okidata, Centronics, NEC, C. Itoh, Smith-Corona, Terminet, etc).

Embedded control codes give full dynamic access to intelligent printer features like: underlining, subscript, superscript, variable font and type size, dot-graphics, etc.

Dynamic (embedded) format controls for: top, bottom, and left margins; line length, lines per page, line spacing, new page, change page numbering, conditional new page, enable/disable justification.

Menu-driven control of these parameters, as well as: pause at page bottom, page numbering, baud rate (so you can run your printer at top speed), and Epson font. "Typewriter" feature sends typed lines directly to your printer, and Direct mode sends control codes right from the keyboard. Special Epson driver simplifies use with MX-80.

Supports single and multi-line headers and automatic centering. Print or save all or any section of the text buffer. Chain print any number of files from cassette or disk.

RAINBOW
CERTIFICATION
SEAL

File and I/O Features: ASCII format files — create and edit BASIC, Assembly, Pascal, and C programs, Smart Terminal files (for uploading or downloading), even text files from other word processors. Compatible with spelling checkers (like Spell 'n Fix).

Cassette verify command for sure saves. Cassette auto-retry means you type a load command only once no matter where you are in the tape.

Read in, save, partial save, and append files with disk and/or cassette. For disk: print directory with free space to screen or printer, kill and rename files, set default drive. Easily customized to the number of drives in the system.

Editing features: Fast, full-screen editor with wordwrap, block copy, block move, block delete, line delete, global search and replace (or delete), wild card search, fast auto-repeat cursor, fast scrolling, cursor up, down, right, left, begin line, end line, top of text, bottom of text; page forward, page backward, align text, tabs, choice of buff or green background, complete error protection, line counter, word counter, space left, current file name, default drive in effect, set line length on screen.

Insert or delete text anywhere on the screen without changing "modes." This fast "free-form" editor provides maximum ease of use. Everything you do appears immediately on the screen in front of you. Commands require only a single key or a single key plus CLEAR.

> *...truly a state of the art word processor... outstanding in every respect.*
>
> — The RAINBOW, Jan. 1982

PROFESSIONAL WORD PROCESSING

You can no longer afford to be without the power and efficiency word processing brings to everything you write. The TRS-80 Color Computer is the lowest priced micro with the capability for serious word processing. And only Telewriter-64 fully unleashes that capability.

Telewriter-64 costs $49.95 on cassette, $59.95 on disk, and comes complete with over 70 pages of well-written documentation. (The step-by-step tutorial will have your writing with Telewriter-64 in a matter of minutes.)

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significant changes and the indication that the trend for new technology will continue. What a challenge! And in your possession is the perfect tool for keeping abreast of this ever-changing phenomenon — the CoCo!

Now, though I don't confess any inclination toward yuppiedom, I even have a CoCo at home. My only regret is that it doesn't do dishes. (I suppose it's ironic that I have a personal computer in my home, but nothing so modern as a dishwasher!) So, when Lonnie departed for vacation and requested that I fill in his usual slot on these pages, I enjoyed the prestige and pleasure of doing it on my CoCo.

And for the first time since joining the staff here at RAINBOW, I truly had the opportunity to combine creativity with technology. Though in my particular job capacity I spend a great deal of time sorting through pages of technical jargon for RAINBOW articles and making them coherent for the self-teaching user, up until now I've never been able to brandish my "writer's" pen (or, more appropriately, word processor) for the pages of our magazine.

This being our Business and Finance issue, I think many of you, whether you're self-employed or working for a company, can relate to keeping up with the high-tech changes that are needed for maintaining and managing a business most efficiently. Its success or failure can depend on it, and you must use all the resources available.

Your CoCo is an invaluable resource for you, and in using it, you've learned how to take the necessary steps for acquiring tomorrow's knowledge.

— Tamara Dunn

> **"And in your possession is the perfect tool for keeping abreast of this ever-changing phenomenon — the CoCo!"**

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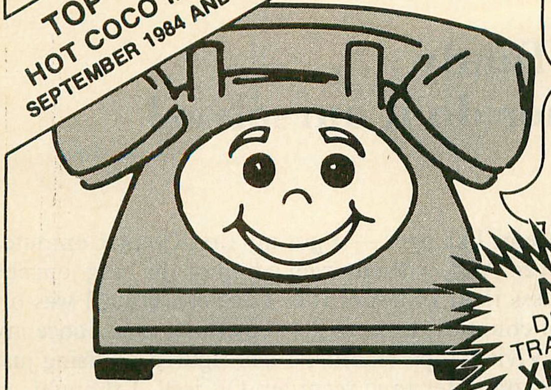

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GOOD LOOKIN'

AUTOTERM shows true upper/lower case in screen widths of 32, 40, 42, 51, or 64 characters with no split words. The width of 32 has extra large letters. Scrolling is forward, backward, and fast. Block graphics pictures are displayed automatically and can be scrolled.

The screen's top line shows operating mode, unused memory size, memory on/off, and caps-lock on/off. It also gives helpful prompts.

SWEET TALKIN'

KEY-BEEP can be on/off. Unacceptable keystrokes cause a lower pitched BOP! This ERROR-BEEBOP can be on/off.

Talks to other computers with Full or Half Duplex; Baud Rate of 110, 150, 300, 600, 1200; Parity as even, odd, mark, space, none; 7 or 8 bit Word; any Stop Bits; all 128 ASCII characters; true line Break; XON/XOFF protocol; and optional line-at-a-time transmission. Able to send and receive text, block graphics, BASIC and ML programs. A 64K machine holds up to 45,000 characters (33,300 in HI-RES).

DUAL PROCESSING lets you review & edit while more data is coming in.

XMODEM for disk file transfer.

Fully supports D.C. Hayes and other intelligent modems.

Talks to your printer with any page size, margins, line spacing, split word avoidance. Embed your printer's control sequences for boldface, underlining, etc. Narrow text can be automatically spread out.

You'll also use Autoterm for simple word processing and record keeping

You can display directories, delete files, transmit directly from disk, and work with files larger than memory. Easily maintain a disk copy of an entire session.

Compatible with TELEWRITER (ASCII) & other word processors.

SMOOTH WALKIN'

AUTOTERM moves smoothly and quickly between word processing and intelligent terminal action. Create text, correct your typing errors; then connect to the other computer, upload your text, download information, file it, and sign-off; then edit the received data, print it in an attractive format, and/or save it on file.

Editing is super simple with the cursor. Find strings instantly, too! Any operating parameter, such as screen width, can be altered at any time. Uncompleted commands can be cancelled.

PUTTY IN YOUR HANDS

The word processor can be used to create, print, and/or save on file your personal KSMs. They let AUTOTERM act like you. For example, it can dial through your modem, sign-on, interact, perform file operations, & sign-off; an entire session without your help. KSMs can answer the phone, prompt the caller, take messages, save them, hang-up, and wait for the next call. The KSM potential is unbelievable!

NO OTHER COMPUTER IN THE WORLD CAN MATCH YOUR COCO'S AUTOMATIC TERMINAL CAPABILITIES!!!

WHAT THE REVIEWERS SAY

"AUTOTERM is the Best of Class."
Graham, *RAINBOW*, 6/83

"The AUTOTERM buffer system is the most sophisticated — and one of the easiest to use..."
Banta, *HOT CoCo*, 9/84

"Almost a full featured word processor..."
Ellers, *RAINBOW*, 11/84

"AUTOTERM's excellent error-handling routines, thorough documentation, and logical, easy-to-use command structure make it stand out."
Parker, *HOT CoCo*, 5/85

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A long while ago — it seems like ages — I got my first Color Computer "system." I had the fever. And, without even a hint of the long journey I was embarking on, less than 14 hours after I got my setup, I was off to Radio Shack on the first of countless treks to get something to enhance my configuration. Seems the old Vivitar tape recorder I had figured on using just wasn't quite right; I needed a computer tape recorder. Oh well, I thought, at least now I'll have everything I need.

Whew, and double whew, was I ever wrong! All too soon, I had to have a Line Printer VII. Then the CoCo's own TV, a modem, lowercase board, new keyboard, 64K chips instead of "piggybacked" 16Ks, green screen monitor and video driver, one, then two disk drives, a new and better printer, bigger TV, RS-232 switch box, LEDs for this and that, 80-column board, RS-232 Pak, and power strips plugged into other power strips. Every time I pass through the electrical department of a hardware store I check the prices on power strips. The tangle of cables and cords and Y-everythings under my desk at home is mind-boggling — and I'm not even a true hardware hacker.

I'm not alone! No sir. Wonder how many rolls of wire, spools of solder, red-handled pliers and yellow-and-black screwdriver sets Radio Shack has sold to CoCo owners? How many wire strippers? Rolls of black electrical tape? How many of us are Radio Shack junkies?

Well, looking back, I realize I've gotten an immense amount of pleasure out of adding all the "extras" over the last three years. Got my own customized configuration, too. While I have yet to get a Multi-Pak Interface or a 1200 Baud modem, and I use OS-9 only when I play *Trivia Fever*, my CoCo conglomeration dominates an entire room in my home, has its own separate, but still overloaded circuit and, count 'em, two phone lines and three telephones. While I'm not even in the same league with the hard-core solder artists, I'm sure there couldn't be another computer setup like it anywhere. It's been lovingly assembled, like a component hi-fi system. But my case is hardly unique. Your own custom installation is likely just as user-modified, eclectic and personalized as mine. It's the CoCo way to go.

Yes, I also use a streamlined, doesn't-need-me-for-anything, state-of-the-art, hard-disk MS-DOS machine in my office along with my "work" CoCo, but it will never engender that special feeling I have for my CoCo at home. My CoCo "grew up" right here, and became part of the family.

So, listen up, Tandy. Yes, we want memory, speed and software compatibility in that new machine you're dragging your heels on. But, just as importantly, we want hardware adaptability. Then, we're likely to be forgiving if it doesn't have a whatever; we'll just add one ourselves. Give us 512 million K and our third-party suppliers will be bank-switching it in a month. Give us a bell; we'll make it whistle.

A lot of us are going to break that warranty seal in a matter of minutes and we're going to be looking for something to modify, to upgrade, to amend, to redefine, to add on — and we'll most likely get the toggle switches, project boards and other nuts and bolts from the neighborhood Radio Shack. So, don't get too slick and don't worry so much about the loose ends. The CoCo crowd is clamoring for new challenges. Let's see it in the stores this summer! We'll smooth out any rough edges; it's a part of the natural evolution of a great computer. Enough of this fidgeting in the nest, shove that fledgling on out and the CoCo Community will teach it to fly!

— Jim Reed

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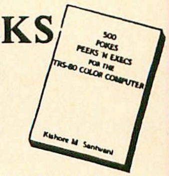
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16K
ECB

A nonviolent game for children . . .

Set your Sails, Keep a Weather Eye out for Storms and Beware of the Jolly Roger!

By David Compton

Several times I have seen in the pages of RAINBOW a plea for nonviolent games for children. *World Trader* is written for the young child, perhaps a second or third grader. Even younger children can use it with parental help.

World Trader is a text Adventure, but the reading is kept to a minimum. It essentially seeks to teach children the names of some countries and the products for which they are best known. The player can't "lose" the game; he is just sent back to the beginning to start over. At the same time, there is an element of nonfatal excitement — pirates or storms may strike

---

David Compton, chairman of the language department at an eastern prep school, lives in Suffield, Connecticut. Much of his programming time is spent in developing foreign language programs.

at any moment, costing you money, or you may arrive in a country to sell your goods, only to find that your customers aren't interested!

All of the instructions are given at the beginning of the game, but here's a summary: The idea is to earn $25,000 or more by buying merchandise in one country and selling it at a profit in another. Note that you may have only one of each item in your hold at any one time. Only four commands are needed by the player, GO, which presents a list of 10 countries you may travel to; BUY, which displays what the inhabitants have for sale (and reduces your cash on hand if you decide to buy); SELL, which disposes of your cargo and updates your cash; and INV, which informs you what's in your cargo hold.

The player must also bear in mind that each time he uses the command GO, his funds are reduced by $100 to pay the cost of shipping and salaries for the crew. The first few trips should be made carefully, or the captain (you) will quickly run out of money.

(Any questions about this program may be sent to the author at 252 N. Main Street, Suffield, CT 06078, phone 203-668-5302. Please enclose an SASE when writing.) ☐

130	88
280	11
460	81
600	252
END	230

The listing: TRADER

```
10 'TRADER
12 ' BY DAVID COMPTON, 252 N. MA
IN ST., SUFFIELD, CT 06078
13 'COPYRIGHT 1985
20 CLS
30 AA$="THE GAME OF":BB$="WORLD
TRADER":PRINT@208-(LEN(AA$)*.5),
AA$:PRINT@272-(LEN(BB$)*.5),BB$
40 FOR DL=1TO2000:NEXT:CLS
50 PRINT"  IN THIS GAME, YOU STA
RT WITH  A SHIP AND $1000. THE O
BJECT IS TO TRAVEL AROUND THE WO
RLD,     BUYING AND SELLING, UNT
IL YOU   EITHER RUN OUT OF MONEY
 OR EARN ENOUGH TO RETIRE."
60 PRINT"  EACH VOYAGE WILL COST
 YOU     $100. IN ADDITION, YOU'
LL HAVE  TO BE CAREFUL OF PIRATE
S AND    STORMS."
70 PRINT"  YOUR CREW UNDERSTANDS
 THE COM-MANDS 'GO', 'BUY', 'SEL
L' AND   'INV' (INVENTORY)."
80 PRINT@448,"PRESS ANY KEY TO B
EGIN"
90 IFINKEY$=""THEN90
100 CLS
110 WE=1000:W$="$$##,###"
120 DIMCN$(10,8)
130 DATA BRAZIL,BRAZILIANS,COFFE
E,500,0,RELICS,2000,0
140 DATA HOLLAND,DUTCH,CHOCOLATE
,100,0,DIAMONDS,10000,0
150 DATA FRANCE,FRENCH,WINE,1000
,0,CHEESE,250,0
160 DATA GERMANY,GERMANS,BEER,30
0,0,CLOTHING,1000,0
170 DATA NORWAY,NORWEGIANS,FISH,
200,0,CRYSTAL,5000,0
180 DATA CHINA,CHINESE,TEA,100,0
,SPICES,2000,0
190 DATA ARGENTINA,ARGENTINES,BE
EF,1000,0,HORSES,3000,0
200 DATA ITALY,ITALIANS,PASTA,35
0,0,STATUES,6000,0
210 DATA DENMARK,DANES,FURNITURE
,5000,0,CLOTH,1000,0
220 DATA INDIA,INDIANS,IVORY,850
0,0,FABRICS,700,0
230 FORX=1TO10:FORY=1TO8:READCN$
(X,Y):NEXTY,X
240 PRINT"YOU BEGIN YOUR VOYAGE
IN LONDON.YOU HAVE";:PRINTUSINGW
$;WE
250 PRINTSTRING$(32,"$");
260 IFWE>24999THENPRINT"YOU HAVE
";:PRINTUSINGW$;WE:PRINT"A SUCCE
SSFUL VOYAGE! YOU RETURN TO ENGL
AND IN TRIUMPH!":END
270 PRINT"YOUR ORDERS,SIR?"
280 INPUTO$
290 IFO$="SELL"THENGOTO420
300 IFO$="BUY"THENGOTO560
310 IFO$="GO"THENFORX=1TO10:PRIN
TX;CN$(X,1):NEXT:GOTO340
320 IFO$="INV"THENGOTO720
330 PRINT"I DON'T UNDERSTAND, CA
PTAIN":GOTO250
340 INPUTDE:IFDE<1ORDE>10THEN250
```

```
350 GOSUB670
360 CLS:L$=CN$(DE,1):PRINT"YOU A
RE IN ";CN$(DE,1)
370 WE=WE-100
380 PRINT"YOU HAVE";:PRINTUSINGW
$;WE
390 IFWE<0THENPRINT"WE'RE OUT OF
 MONEY, CAPTAIN.    WE'LL HAVE T
O RETURN TO ENGLAND TO GET A LOA
N.":FORX=1TO2000:NEXT:END
400 GOTO250
410 '********SELL*******
420 FORD=1TO10:IFCN$(D,5)="1"THE
N450ELSENEXTD
430 FORD=1TO10:IFCN$(D,8)="1"THE
N450ELSENEXTD
440 PRINT"YOU HAVE NOTHING TO SE
LL.":GOTO270
450 IFRND(10)=6THENPRINT"THE ";C
N$(DE,2);" AREN'T":PRINT"INTERES
TED IN BUYING.":O$="GO":GOTO310
460 PRINT"THE ";CN$(DE,2);" WILL
 BUY ";
470 FORX=1TO10:IFCN$(X,5)="1"THE
NPRINTCN$(X,3):PRINT"SOLD FOR";:
PRINTUSINGW$;VAL(CN$(X,4))+(.3*V
AL(CN$(X,4))):WE=WE+VAL(CN$(X,4)
)+(.3*VAL(CN$(X,4)))
480 CN$(X,5)="0"
490 NEXTX
500 FORX=1TO10:IFCN$(X,8)="1"THE
NPRINTCN$(X,6):PRINT"SOLD FOR";:
PRINTUSINGW$;VAL(CN$(X,7))+(.3*V
AL(CN$(X,7))):WE=WE+VAL(CN$(X,7)
)+(.3*VAL(CN$(X,7)))
510 CN$(X,8)="0"
520 NEXTX
530 PRINT"YOU HAVE";:PRINTUSINGW
$;WE
540 GOTO250
550 '******BUY******
560 PRINT"THE ";CN$(DE,2);" WISH
 TO SELL:":PRINTCN$(DE,3),:PRINT
USINGW$;VAL(CN$(DE,4)):PRINTCN$(
DE,6),:PRINTUSINGW$;VAL(CN$(DE,7
))
570 PRINT"WHICH WILL YOU BUY?"
580 INPUTBU$
590 IFBU$<>CN$(DE,3)ANDBU$<>CN$(
DE,6)THENPRINT"THEY DON'T HAVE A
NY FOR SALE"
600 IFBU$=CN$(DE,3)THENIFWE<VAL(
CN$(DE,4))THENPRINT"NOT ENOUGH M
ONEY":GOTO250
610 IFBU$=CN$(DE,6)THENIFWE<VAL(
CN$(DE,7))THENPRINT"NOT ENOUGH M
ONEY":GOTO250
620 IFBU$=CN$(DE,3)THENCN$(DE,5)
="1":WE=WE-VAL(CN$(DE,4))
630 IFBU$=CN$(DE,6)THENCN$(DE,8)
="1":WE=WE-VAL(CN$(DE,7))
640 PRINT"YOU HAVE";:PRINTUSINGW
$;WE
650 GOTO250
660 END
670 CA=RND(-TIMER):CA=RND(10)
680 IFCA=1THENLO=RND(10)*10:PRIN
T"YOU'RE ATTACKED BY PIRATES DUR
- ING THE VOYAGE. THEY STEAL SOM
E OF YOUR MONEY.":WE=WE-LO:FORDL
=1TO4000:NEXTDL:RETURN
690 IFCA=2THENLO=RND(10)*10:PRIN
T"A BAD STORM! SEA WATER DAMAGES
  YOUR CARGO. YOU'VE LOST $";LO;
"IN MERCHANDISE.":WE=WE-LO:FORDL
=1TO4000:NEXTDL:RETURN
700 RETURN
710 '***********INV******
720 FORD=1TO10:IFCN$(D,5)="1"THE
NPRINT CN$(D,3)
730 NEXTD
740 FORD=1TO10:IFCN$(D,8)="1"THE
N PRINTCN$(D,6)
750 NEXT D
760 GOTO250
```

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Receipt Maker and File

By Bill Tottingham

Once you've had the CoCo for a while, as most of you have probably experienced, you begin to look for ways to use it for about anything you can think of, if for no other reason than to prove your computer is more than "just a toy," as the guy down the street with the $5,000 IBM says. Any of us who have spent any time with the CoCo know that's a ridiculous notion. I know several people who run small volume businesses who would love to use the CoCo due to its relatively low cost. One particular person wanted a program that not only printed out a receipt (he was writing them out by hand), but also would save the information to disk for later tax purposes. This program is the result — no need for a million dollar computer and another million in software.

To use *Receipt File* you must have at least 32K and a disk, and should have a printer. The program is set to use a DMP-100 at 1200 Baud. If you are going to use a different printer, change the received control codes in the following lines:

Line	DMP-100	Function
830	`POKE149,0:POKE150,41`	1200 Baud printer
850	`CHR$(15)`	Enable underline
860	`CHR$(14)`	Disable underline
870	`CHR$(31)`	Elongated mode
880	`CHR$(30)`	Character mode

Entering Data

After making any needed changes, you are ready to run the program. The first thing you will see is the main menu. On it will be five choices (see Figure 1). Since we're just getting started, press '2' for "Enter new data." You will

Bill Tottingham is an auto body worker who writes programs for children and specific business applications.

then be asked the date. Enter it in the same format the example shows, then press ENTER. You will then be asked if the information given was correct. (When entering new data you will always be asked if the information provided was correct.)

Next you will be asked for a "Receipt number." *You must enter a number.* This is the number the program uses for filing. It also must be a number different from one already on file. The best bet is to give the receipt a number incremented by one over the preceding receipt. For the first one, enter 001.

You will now be asked to enter "Received of." Here you may enter the name of your customer.

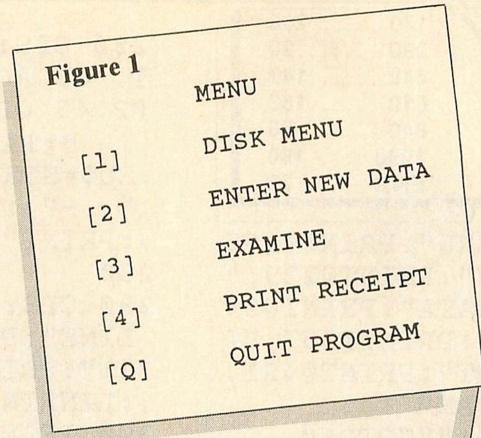
Next comes the "Dollar amount paid." This is exactly what it says. Enter this like the example shows.

Now we come to "Amount of Account." This is the total purchase price. You can use the balance due from any previous payment of the same account. This will be printed on the receipt with the amount paid and a balance due. If the amount of account is the same as the amount paid, simply enter the amount paid here again if you wish. If not, press ENTER.

Finally we come to the comment line. Enter anything you wish; however, it is customary to use this for what was purchased, or the nature of the transaction. If you are the purchaser, you might want to enter the name of the other party, so if the hard copy is lost you will still have the information come tax time. There is a 30 character space here.

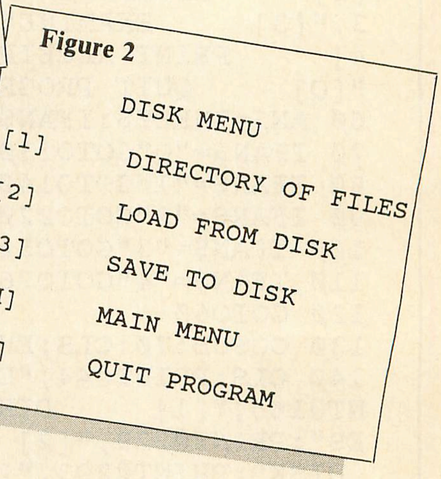
You now find yourself back at the main menu. If you want to examine the information to be printed and/or saved, press '3'. If any of the information is wrong, press 'M' to return to the main menu and press '2' to re-enter all the data. If everything is correct, the receipt can be printed or saved to disk. Press 'M' to get back to the menu.

Figure 1



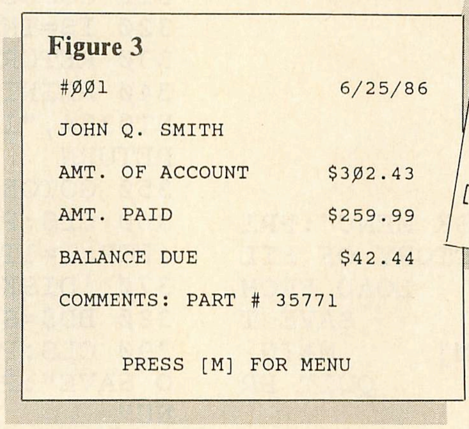
```
            MENU

[1]     DISK MENU
[2]     ENTER NEW DATA
[3]     EXAMINE
[4]     PRINT RECEIPT
[Q]     QUIT PROGRAM
```

Figure 2



```
        DISK MENU
[1]     DIRECTORY OF FILES
[2]     LOAD FROM DISK
[3]     SAVE TO DISK
[M]     MAIN MENU
[Q]     QUIT PROGRAM
```

Figure 3



```
#001                          6/25/86

JOHN Q. SMITH

AMT. OF ACCOUNT               $302.43

AMT. PAID                     $259.99

BALANCE DUE                    $42.44

COMMENTS: PART # 35771


        PRESS [M] FOR MENU
```

Saving to Disk

If you are planning to save this data on disk, it can be done now or after printing the receipt.

To save on disk, press '1' for the disk menu (Figure 2). Here again there will be five choices. Since we are saving data, press '3'. You will then be asked to press ENTER for save or 'M' for menu. After the save is completed, you will be returned to the main menu.

Printing the Receipt

To print the receipt, press '4'. You will be asked if you want a copy. Pressing 'Y' tells the printer to print two receipts. Before answering this prompt make sure your printer is on and ready to go.

After printing, you will be returned to the main menu. Here you may save the data (if not previously saved), enter new data or look at and/or load previous accounts.

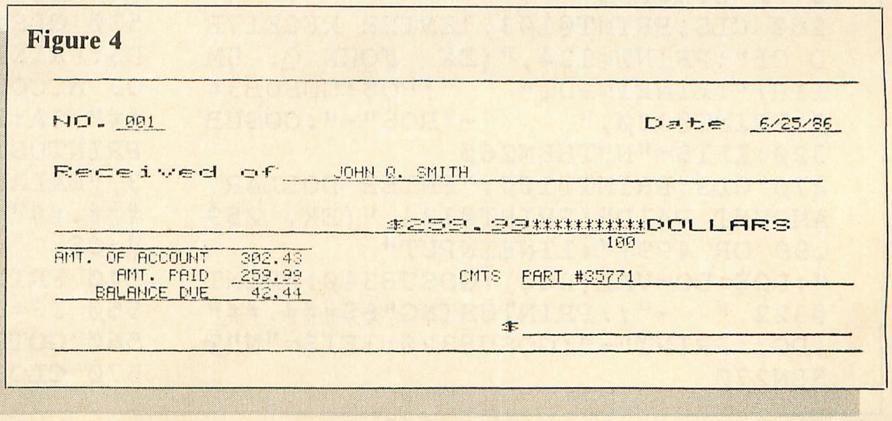
Entering Data from Disk

To load data from disk, first get to the disk menu by pressing '1' on the main menu. The easiest way to load is to press '1' from the disk menu. A list of receipt numbers will appear on the screen preceded by a number; for example: 1) 001. To load receipt #001, press '1' and ENTER and the file will load. If you already know the receipt number, press '2' on the disk menu and enter the number at the prompt.

After loading, you will automatically be in the examine mode (Figure 3). From there you can print out a receipt, load a different receipt or enter new data.

As with all programs, this one can be modified to your specific needs. Some ideas might be to incorporate a different filing system if you are in a higher volume business. To enter data faster, you could hack off everything after the line input statements in lines 240 through 270 and in Line 280 after the `BD$=STR$(BD)` statement. A line could also be added in the printer routine that would print a line under the receipt for written comments. □

Figure 4



```
NO. 001                                         Date 6/25/86

Received of  JOHN Q. SMITH

                              $259.99*********DOLLARS
                                              100
AMT. OF ACCOUNT   302.43
      AMT. PAID   259.99             CMTS  PART #35771
    BALANCE DUE    42.44

                                     $
```

The listing: RECEIPT

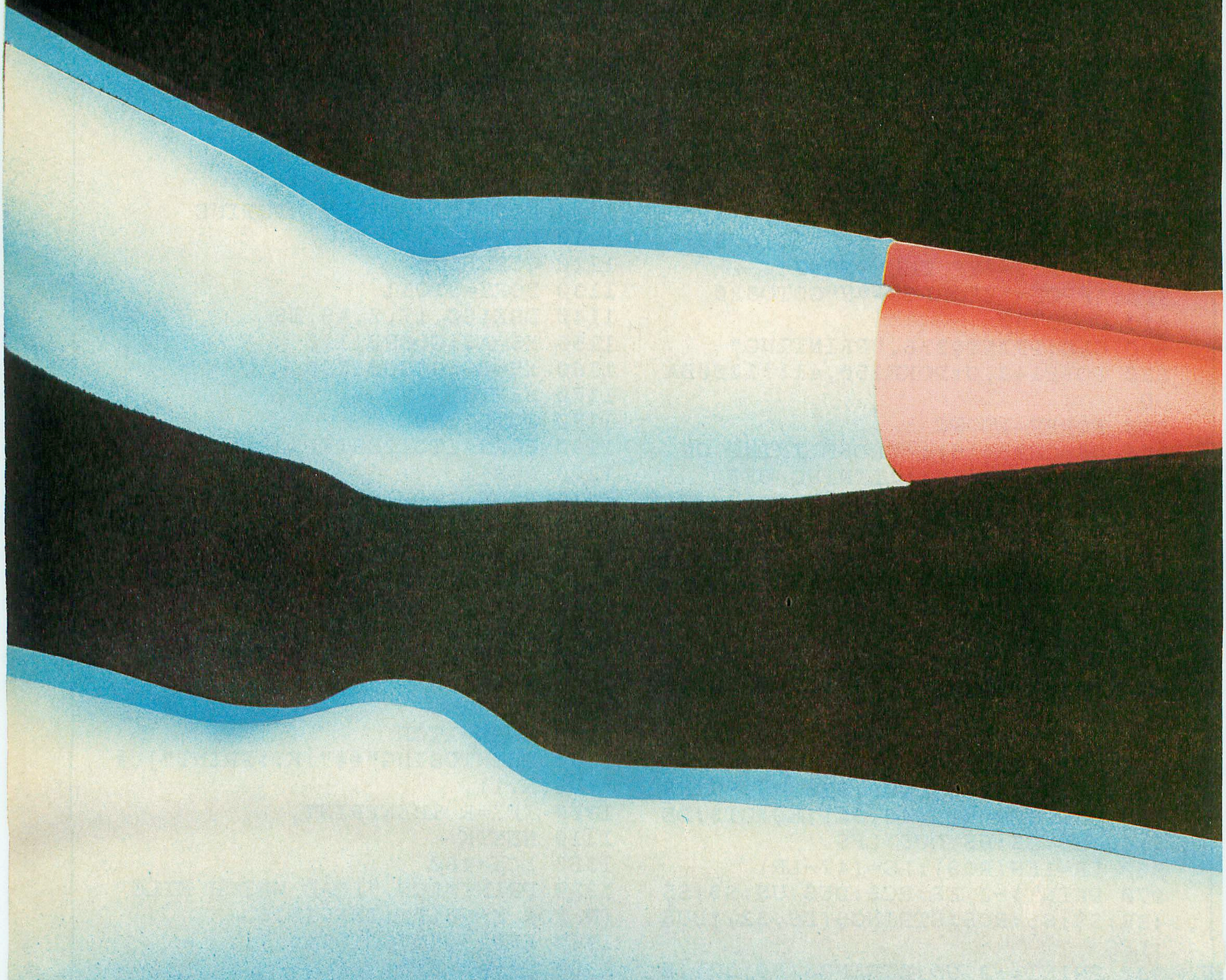
170	205
290	20
440	142
610	183
840	85
1090	190
END	72

```
10 CLEAR
20 CLEAR5000
30 VERIFY ON
40 DIMP$(35,2)
50 CLS:PRINT@46,"MENU":PRINT@165
,"[1]     DISK MENU":PRINT@229,"
[2]     ENTER NEW DATA":PRINT@29
3,"[3]     EXAMINE":PRINT@357,"[
4]     PRINT RECEIPT":PRINT@421,
"[Q]     QUIT PROGRAM"
60 AN$=INKEY$:IFAN$=""GOTO60
70 IFAN$="Q"GOTO130
80 IFAN$="1"GOTO140
90 IFAN$="2"GOTO220
100 IFAN$="3"GOTO520
110 IFAN$="4"GOTO760
120 GOTO60
130 GOSUB570:CLS:END
140 CLS:PRINT@44,"DISK MENU":PRI
NT@165,"[1]     DIRECTORY OF FIL
ES":PRINT@229,"[2]     LOAD FROM
 DISK":PRINT@293,"[3]     SAVE T
O DISK":PRINT@357,"[M]     MAIN 
MENU":PRINT@421,"[Q]     QUIT PR
OGRAM"
150 I$=INKEY$:IFI$=""GOTO150
160 IFI$="1"GOTO1100
170 IFI$="2"GOTO450
180 IFI$="3"GOTO370
190 IFI$="M"GOTO50
200 IFI$="Q"GOTO130
210 GOTO150
220 'ENTER DATA ROUTINE
230 GOSUB570
240 CLS:PRINT@103,"ENTER RECEIPT
 DATE":PRINT@136,"(EX. 6/25/85)"
:LINEINPUT"           ";D$:GOSUB
340:PRINT@320,"      -"D$"-":GOS
UB320:IFI$="N"GOTO240
250 CLS:PRINT@103,"ENTER RECEIPT
 #":PRINT@136,"(EX. 001)":LINEIN
PUT"          ";N$:GOSUB340:PRIN
T@320,"     -"N$"-":GOSUB320:IFI
$="N"GOTO250
260 CLS:PRINT@103,"ENTER RECEIVE
D OF":PRINT@134,"(EX. JOHN Q. SM
ITH)":LINEINPUT"   ";RO$:GOSUB34
0:PRINT@320,"     -"RO$"-":GOSUB
320:IFI$="N"THEN260
270 CLS:PRINT@100,"ENTER DOLLAR 
AMOUNT PAID":PRINT@134,"(EX. 259
.99 OR 499)":LINEINPUT"
";DO$:DO=VAL(DO$):GOSUB340:PRINT
@322,"  -";:PRINTUSING"$$###.##"
;DO;:PRINT"-":GOSUB320:IFI$="N"T
HEN270
280 CLS:PRINT@99,"ENTER TOTAL AM
T. OF ACCOUNT":PRINT@135,"(EX. 3
02.43 OR 500)":LINEINPUT"
    ";TA$:TA=VAL(TA$):BD=(TA-DO)
:BD$=STR$(BD):GOSUB340:PRINT@323
,"  -";:PRINTUSING"$$####.##";TA
;:PRINT"-":GOSUB320:IFI$="N"THEN
280
290 CLS:PRINT@102,"ENTER COMMENT
 LINE":PRINT@134,"(EX. PART #357
71)":PRINT@223,"]":PRINT@192,"["
;:LINEINPUTC$
300 IFLEN(C$)>30GOTO360
310 GOSUB570:GOTO50
320 I$=INKEY$:IFI$=""THEN320
330 RETURN
340 PRINT@290,"YOU ENTERED-":PRI
NT@354,"IS THAT CORRECT? (Y/N)":
RETURN
350 GOTO50
360 CLS:PRINT@170,"LINE TO LONG"
:FOR T=1TO500:NEXTT:GOTO290
370 'DISK ROUTINE
380 BD$=STR$(BD)
390 CLS:PRINT@166,"HIT <ENTER> T
O SAVE":PRINT@232,"OR <M> FOR ME
NU"
400 I$=INKEY$:IFI$=""GOTO400
410 IFI$="M"GOTO50
420 IFI$=CHR$(13)GOTO440
430 GOTO400
440 GOSUB570:CLS:GOSUB580:GOSUB7
40:GOSUB570:GOTO50
450 CLS:PRINT@170,"ENTER FILE #"
:PRINT@330,"[M] FOR MENU"
460 PRINT@242,"]":PRINT@236,"[";
:LINEINPUTN$
470 Z=LEN(N$):IFZ>5GOTO450
480 IFN$="M"GOTO50
490 CLS:PRINT@168,"LOADING #";N$
:PRINT@182,STRING$(10,32)
500 GOSUB570:GOSUB580:GOSUB750:G
OSUB670
510 TA=VAL(TA$):DO=VAL(DO$):BD=V
AL(BD$)
520 BD=(TA-DO)
530 CLS:PRINT@1,"#";N$:PRINT@20,
D$:PRINT@67,RO$:PRINT@131,"AMT.
OF ACCOUNT  ";:PRINTUSING"$$###.
##";TA:PRINT@201,"AMT. PAID  ";:
PRINTUSING"$$###.##";DO:PRINT@26
3,"BALANCE DUE  ";:PRINTUSING"$$
###.##";BD:PRINT@323,"COMMENTS:
";C$
540 PRINT@458,"[M] FOR MENU"
550 I$=INKEY$:IFI$="M"GOTO50
560 GOTO550
570 CLOSE#1:RETURN
```

```
580 OPEN"D",#1,N$,110
590 FIELD#1, 10 AS XTA$,10 AS XD
$,10 AS XDO$,10 AS XBD$,30 AS XR
O$,30 AS XC$,10 AS XDT$
600 LSET XTA$=TA$
610 LSET XD$=DY$
620 LSET XDO$=DO$
630 LSET XBD$=BD$
640 LSET XRO$=RO$
650 LSET XC$=C$
660 LSET XDT$=D$
670 TA$=XTA$
680 D$=XDT$
690 DO$=XDO$
700 BD$=XBD$
710 RO$=XRO$
720 C$=XC$:RETURN
730 RETURN
740 PUT#1:RETURN
750 GET#1:RETURN
760 'PRINTER ROUTINE
770 CLS:PRINT@133,"DO YOU WANT A
 COPY FOR":PRINT@165,"FOR YOUR R
ECORDS ALSO?":PRINT@205,"(Y/N)"
780 PC$=INKEY$:IFPC$=""GOTO780
790 IF PC$="Y" THEN PC=2
800 IFPC$="Y"ORPC$="N"GOTO820
810 GOTO780
820 CLS:PRINT@236,"PRINTING"
830 POKE149,0:POKE150,41:'1200BA
UD
840 FORPP=1TOPC
850 U$=CHR$(15):'UNDERLINING ON
860 DU$=CHR$(14):'LINING OFF
870 E$=CHR$(31):'DOUBLEWIDTH/ON
880 DE$=CHR$(30):'D.W./OFF
890 NO$="NO.":DT$="Date ":RC$="R
eceived of":DL$="DOLLARS"
900 AC$="AMT. OF ACCOUNT  "
910 AP$="      AMT. PAID  "
920 BD$="   BALANCE DUE  "
930 LF$=STRING$(2,10):S$=CHR$(32
)
940 PRINT#-2,U$;STRING$(80,32);S
TRING$(2,10);DU$
950 PRINT#-2,E$;NO$;DE$;U$;S$;N$
;S$;DU$;STRING$(46,32);E$;DT$;DE
$;U$;S$;D$;S$;DU$;LF$
960 LR=LEN(RO$):LS=(47-LR)
970 PRINT#-2,E$;RC$;DE$;U$;S$;S$
;S$;S$;S$;RO$;STRING$(LS,32);DU$
;LF$
980 PRINT#-2,U$;STRING$(30,32);E
$;:PRINT#-2,USING"$$###.##";DO;:
PRINT#-2,DE$;STRING$(11,42);DU$;
E$;DL$;DE$
990 PRINT#-2,U$;STRING$(25,32);D
U$;STRING$(28,32);"100"
```

```
1000 PRINT#-2,AC$;:PRINT#-2,USIN
G"####.##";TA
1010 C=LEN(C$):CL=(32-C)
1020 PRINT#-2,AP$;U$;:PRINT#-2,U
SING"####.##";DO;:PRINT#-2,DU$;S
TRING$(15,32);"CMTS   ";U$;C$;STR
ING$(CL,32);DU$
1030 PRINT#-2,U$;BD$;:PRINT#-2,U
SING"####.##";BD;:PRINT#-2,CHR$(
32)
1040 PRINT#-2,CHR$(10);DU$;STRIN
G$(43,32);E$;"$";DE$;U$;STRING$(
32,32)
1050 PRINT#-2,U$;STRING$(80,32);
DU$
1060 PRINT#-2,STRING$(10,10)
1062 IFPC=2GOTO1065
1063 GOTO1070
1065 IFPP=1THENPRINT#-2,STRING$(
38,10)
1070 NEXTPP
1080 GOTO50
1090 CLS:END
1100 CLS:'DIRECTORY ROUTINE
1110 CLEAR
1120 GOSUB570
1130 FORZ=3TO11
1140 DSKI$0,17,Z,A$,B$
1150 X$=A$:GOSUB1190
1160 X$=B$:GOSUB1190
1170 NEXTZ
1180 GOTO1280
1190 FORJ=1TO128STEP32
1200 R=R+1
1210 P$(R,1)=MID$(X$,J,8)
1220 IFLEFT$(P$(R,1),1)=CHR$(255
)THENR=R-1:GOTO1280
1230 IFLEFT$(P$(R,1),1)=CHR$(0)T
HENR=R-1:GOTO1260
1240 P$(R,2)=MID$(X$,J+8,3)
1250 IFP$(R,2)<>"DAT"THENR=R-1
1260 NEXTJ
1270 RETURN
1280 FORK=1TOR
1290 PRINTUSING"##";K;:PRINT"] #
";P$(K,1),
1300 IFK=R THENPRINT,
1310 NEXTK
1320 LCN=480
1330 PRINT@LCN,"LOAD WHICH FILE
(M FOR MENU)";:INPUTP1$
1340 IFP1$="M"GOTO140
1350 P=VAL(P1$)
1360 IFP<1ORP>R THENLCN=448:GOTO
1330
1370 FILE$=P$(P,1)
1380 N$=FILE$
1390 GOTO490
```

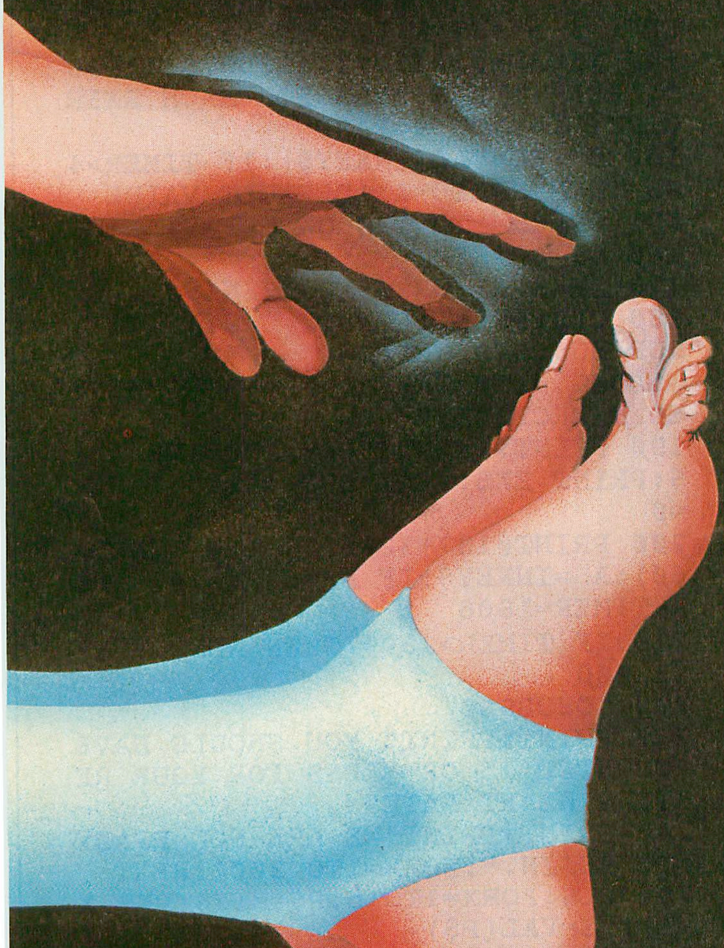
The 15-Minute



32K
ECB

Color Computer Workout

By William Talada



After many unsuccessful attempts to be home when an exercise program was on television, I finally decided that the only way I would exercise was if I had a program readily available to show me how to do each exercise and keep track of the time for me. Hence, *Workout* was developed.

Workout is designed to give maximum conditioning to the heart, lungs and muscles in the least amount of time. Just `CLOAD` or `LOAD` and `RUN`. You will see credits and a title page displayed, and you are asked to enter your current exercise level. If you don't respond within five seconds, the program defaults to an intermediate level, which can be changed by editing Line 150.

Next, you will have time to warm up and stretch out to five different recommended exercises. After stretching, lie down and take your pulse for 15 seconds. The given resting pulse rate is for a healthy person. It should be your main goal to lower your resting heart rate.

The instructions that follow the name of each exercise should be followed even if your television partner doesn't. There are 10 seconds of pause and 10 seconds of exercise repeated three times for each of the 15 exercises. Afterwards, there is

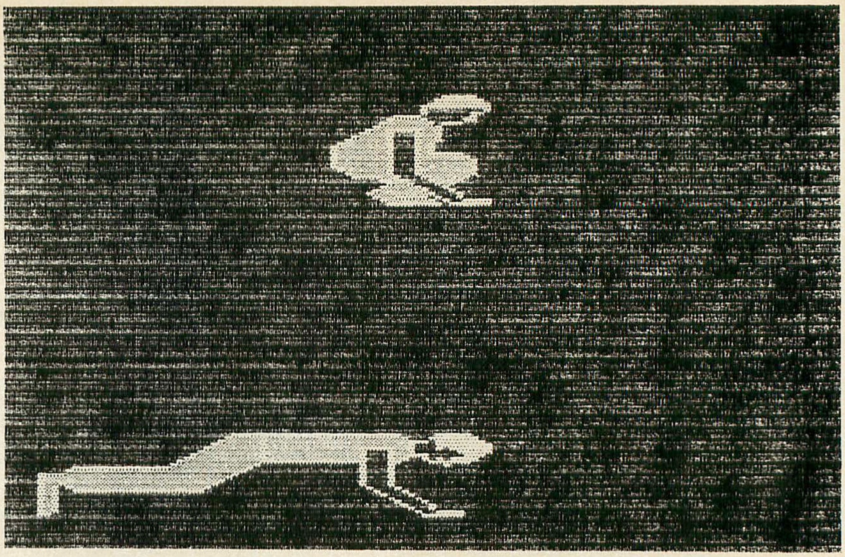
---

Bill Talada has been programming in BASIC, COBOL and RPG II for two years now. He is mostly self-taught, programming only when he can sneak out of bed at 5 o'clock in the morning without waking his wife, Robyn.

time to take an exercise heart rate. If you don't reach the minimum rate, your workout was of little benefit to you. Again, the numbers are for a young, healthy person. Allow two beats less for every 10 years of age over 30. The program ends after a cool-down and recovery heart rate. The 15 minute workout lasts 23 minutes including warm-up and cool-down.

As with all exercise programs, it is recommended that you check with your physician before undertaking *Workout*.

(Any questions regarding *Workout* can be directed to Mr. Talada at 739 Sunset Road, Wrightsville, PA 17368. Please include an SASE when writing.) □



110	244	700	224
210	179	760	209
350	104	840	203
500	254	920	89
610	68	END	168

The listing: WORKOUT

```
10 'DOWN ARROW BYPASSES WARM-UP,
TO CHANGE RELATIVE EXERCISES OR
DEFAULT SPEED EDIT LINES 140-150
20 CLEAR2000:CLS:PCLS:PCLEAR8
30 R$="ND4R2E2R4F3D2G3U2H5F2L1D1
BF3L1BD1NR2G1U1L1NU1L1H1U1L2":F$
="ND4R2E2R5F3D2G3L2E2U4H2BD2L1BD
2L1U1BH1G1D2F1BR2R1BD2L3H2L2"
40 PRINT@135,"BILL TALADA":PRINT
@168,"PRESENTS"
50 D$="D20R3E3F3R3U4BE3F2R1E2U6H
2L1G2D6BG3F4R3E4D4R3U6BE3D1F4U6G
1L3BG3F6R4U9F9U3F3R3E4D1F3R5E3U1
4R4D17R3U17R6U3L16D14G2L1H2U14L3
D4BG3H2L1G2D6F2R1E2U6BE3H4L3G4D1
0H6E8L4G6U6L3D3H3BD4D3G1L3U5R3F1
BU4L7D4H4L3G4U4L3D16H3G3U16L3"
60 PMODE1,1:PCLS:DRAW"BM30,60S9"
+D$:PAINT(32,62),6,8
70 PMODE1,3:PCLS:DRAW"BM25,70S10
"+D$:PAINT(27,72),6,8
80 PMODE1,5:PCLS:DRAW"BM20,70S11
"+D$:PAINT(22,72),6,8
90 PMODE1,7:PCLS:DRAW"BM15,70S12
"+D$:PAINT(17,72),6,8
100 FORX=1TO7 STEP2:PMODE1,X:SCR
EEN1,1:PLAY"O1V25T255ECECECECECE
CECEC":NEXTX:FORX=1TO4:PLAY"T98D
FEAGBC":NEXT:FORX=1TO999:NEXT
110 CLS:PRINT:PRINT"THE EXERCISE
 PROGRAM IS DESIGNEDTO GIVE ALL
MUSCLES AN INTENSE  WORKOUT AS W
ELL AS IMPROVING    THE HEART AN
D LUNGS."
120 PRINT:PRINT"YOU MUST EXERCIS
E AT LEAST FOUR TIMES A WEEK TO
GAIN THE FULL   BENEFIT OF THIS
PROGRAM."
130 PRINT:PRINT"ENTER SPEED
                 BEGINNER TO EXP
ERT  1-5":SP=VAL(INKEY$)
140 TIMER=0:PE$="111139325111139
":'RELATIVE SPEEDS FOR EACH EXER
CISE  1=SLOW 9=FAST
150 SPEED=VAL(INKEY$):IF TIMER>4
00 THEN SPEED=4:'DEFAULT VALUE
SET SPEED= TO 1 SLOW 5 FAST
160 SP=SP*SP
170 IF SP<1 OR SP>25THEN150
180 CLS:PRINT:PRINT"   STRETCH Y
OUR MUSCLES WHILE      FOLLOWING
 ALONG WITH THESE      RECOMMEND
ED EXERCISES:"
190 PRINT:PRINT:FORY=1TO5:READEX
$:PRINT EX$:PLAY"ABCP4ABC":TIMER
=0
200 PRINT@187+32*Y,30-INT(TIMER/
60):A$=INKEY$:IF A$=CHR$(10) THE
N TIMER=1808
210 IF TIMER>1809 THEN NEXT Y EL
SE 200
220 GOSUB960
230 PRINT:PRINT" YOU SHOULD HAVE
 COUNTED 15 OR  LESS FOR YOUR RE
STING HEART RATE"
240 PRINT:PRINT"WE ARE NOW READY
 TO BEGIN.":FORX=1TO 3000:NEXT
250 CLS:FORX=1TO15:P$=MID$(PE$,X
,1):PE=VAL(P$)
260 IF X=11 THEN GOSUB1000
```

```
270 C=2-RND(2):F=9-RND(2)
280 PRINT@68,"REPETITIONS  1":PR
INT@164,"EXERCISE "X
290 READE$:PRINT@260,E$
300 READI$:IF X=12THENI$="ELBOWS
 IN AGAINST SIDES" ELSE IF X=13T
HENI$="  RIGHT ARM DOWN" ELSE IF
 X=14THENI$="HEEL TO OUTSIDE OF
HAND"
310 PRINT@353,I$:PRINT@426,"REST
"
320 IF C=0 THEN D=6 ELSE D=5:E=7
-RND(2):TIMER=0
330 FORZ=1TO5STEP2
340 READD$:PMODE1,Z:COLOR 7,D:PC
LS:DRAWD$:PAINT(255,191),E,7:REA
D A,B:PAINT(A,B),F,7:READA,B:PAI
NT(A,B),7,7:IF X=4 OR X=13THENPA
INT(145,55),E,7
350 NEXT Z
360 FORY=1TO3:PMODE1,1:IF TIMER>
420 AND TIMER<1200 THEN TIMER=42
0 ELSE TIMER=0
370 PRINT@80,Y:V=INT(TIMER/60):V
=9-V:PRINT@431,V
380 IF TIMER>420 THEN SCREEN1,C
ELSE370
390 IF TIMER>590 THEN400ELSE390
400 PLAY"O2L30;F"
410 FOR Z=1TO5 STEP4:PMODE1,Z:PL
AY"C":SCREEN1,C:FOR S=1TO1400 ST
EP SPEED+PE:NEXTS:PMODE1,3:SCREE
N1,C:FOR S=1TO700 STEP SPEED+PE:
NEXTS,Z
420 IF TIMER<1200 THEN400
430 NEXTY,X
440 FOR X=1TO3000:NEXT:GOSUB960
450 PRINT:PRINT"YOUR EXERCISE HE
ART RATE SHOULD BE BETWEEN 32 AN
D 45 DEPENDING  ON YOUR AGE."
460 PRINT:PRINT"IF YOU COUNTED M
ORE YOU PROBABLYEXERCISED TOO HA
RD FOR YOUR     PRESENT HEALTH."
470 PRINT:PRINT"STRETCH AND WALK
 AROUND FOR A   FEW MINUTES.":TI
MER=0
480 PRINT@470,150-INT(TIMER/60):
A$=INKEY$:IFA$=CHR$(10) THEN530
490 IF TIMER<9000THEN480
500 GOSUB 960
510 PRINT:PRINT"YOU SHOULD HAVE
A RECOVERY RATE OF 30 OR LESS."
520 FORX=1TO4000:NEXT
530 PMODE1,7:SCREEN1,0:FORX=1TO4
:PLAY"O2T20V15FGFGFGFGDABEAFGFGF
G":NEXTX:FORX=1TO5000:NEXT:CLS:P
RINT@170,"YOU MADE IT!":PRINT
540 PRINT@400," ":END
550 DATA" SLOW JUMPING JACKS","
HURDLERS STRETCH"," TRUNK ROTATI
ONS"," REACH FOR THE SKY"," LOOS
EN NECK AND ANKLES"
560 DATA"NIP-UPS","DON'T ALLOW F
EET TO HIT FLOOR"
570 DATA"S8BM120,139U5R16E1R2F1R
15F2R1U4E2D11L1H2G2L55H1NU4L26U2
R3H1R11E1R6H1U2NG3R2E1D1R1F2D1R1
BH1E2R19F1",110,130,62,130
580 DATA"S8BM120,139U6R4E7U1E1R1
E8R4U4E2D10L1G21L12H12U2NE2L1H17
E2F1R1D1F7R1F3E2NL4F2NL1R1D1F1D2
BG1NH4E1R3F9R4",110,130,76,97
590 DATA"S8BM120,139U5E2U18E2R1U
1H3U3F8G1D24G3L12H3U10E1NR5U26R2
D3R1D10F1D3ND8F3NL3D2NL1F1L1D1G2
F2D4F1",110,130,114,100
600 DATA"SQUAT THRUST","GO TO FU
LLY EXTENDED POSITIONS"
610 DATA"S8BM122,94R4D35G2F1R3F2
L11U1E2H2U26H2U5E2U20E2A3XR$;A0F
2D17F4R1D1F1G2H10U11R4D11F2",120
,150,120,35
620 DATA"S8BM120,120R3NF3E1U2NR8
E3R4F2D2NH1G1NL1G1D1L1G1L2G1D4G1
D3R4F2D4G4F2D1F1R3D1L5H9U13R4D13
NE2F4BG2G1NL4F2L7H3E3H2L3H3U6E9"
,110,150,140,110
630 DATA"S8BM120,120F2XR$;G2L1BL
4U4R4D11F6D1F1R3D1L5H9U7L14NU6G9
L18H2G1D7G1L1U12R3E2R13E10R23",3
0,150,135,122
640 DATA"PUSH-UPS"," ELBOWS PERP
ENDICULAR TO SIDES"
650 DATA"S12BM200,68U4L4D4L14NU6
G2L2G2L1G1L3G1L3G1L3G1L3G1L2H2D7
G1L1U11R2E2R2E1R3E1R3E1R3E1R1E6R
23F2XR$;G2L1D7G1D6R2D1L5U15",58,
85,230,50
660 DATA"S12BM150,88NR12H1NU5G1L
4G2L8G1L10H2D6G1L1U10R2E2R6E2R7E
2R28F2ND4XR$;G2L3E1U3H1L2G1D12R5
U1L2U9BH2ND1R1",58,85,230,68
670 DATA"S12BM152,95NR12H1NU5L26
H2D7G1L1U11R2E2R18E1R6F1R19F2XR$
;G2L3U2R1E1U2H2L2G1D11R5U1L2U7",
80,80,235,80
680 DATA"SIDEWINDER","LEFT ARM D
OWN  LIFT LEG HIGH"
690 DATA"S12BM111,70D7L2G16H2D1G
1L2U4R1E1NE15H1D1G1H3E1R1H1E17R1
3D3R3U3R10H1NE2H4G4F1BL5U1E8F10D
3XF$;D2G2D1NL3D12F1G2H2L1U1R1U15
L18",140,80,210,80
700 DATA"S12BM111,70D7L2G16H2D1G
```

```
1L2U4R1E16L21U2G1L2U4R2F1U2R32BR
5H1E4F4NE2F1L10D3L3U4E8F10D3XF$;
D2G2D1NL3D12F1G2H2L1U1R1U15L18",
140,80,210,80
710 DATA"S12BM111,70D7L2G15H2D1G
1L2U4R1E16H16E1L1H1E3F1D1E1F15R7
BR5H1E4F4NE2F1L10D3L3U4E8F10D3XF
$;D2G2D1NL3D12F1G2H2L1U1R1U15L18
",140,80,210,80
720 DATA"TREAD MILL","BACK AND F
ORTH BETWEEN HANDS"
730 DATA"S12BM100,100D5R10F1R2U4
R4D9G1D9R3D1L6U16L2F1D10G2R3D2L8
U2E1H1U6L9H3F2G6L16H2D7G1L1U11R2
E2R11E8ND5E3R23F2XR$;G2L1",120,1
00,180,98
740 DATA"S12BM100,100D6R13BR4U4L
4D20R6U1L3U9E1U5R1E2U4XR$;U4H2L2
3G3D5F2L8G2H1L1D10R1E1U5F2R17E2U
3H4",120,100,180,98
750 DATA"S12BM97,100D6NR10G10L16
H2D7G1L1U11R2E2R11E11R23F2XR$;G2
L1BL4U4R4D10G1D8R3D1L6U16L3F2D8G
2R3D2L6U2H2U5L7H2",120,100,180,9
8
760 DATA"RUNNING IN PLACE","KNEE
S WAIST HIGH"
770 DATA"S8BM128,162U5NE2U4NF2U1
7NL5E1U9BU6F5E4U2R1D1E1F2G9H9E3F
2U4H2L4A3XR$;A0L4G2D18H7E7D6G2F2
D6G2D5F2D26F2G2D1R11H2L3H1E2U6E9
U4H9",120,90,120,50
780 DATA"S8BM121,86R5D35G2F1R3F2
L11U1E2H2U26H2U5E2U20E2A3XR$;A0F
2D17F4R1D1F1G2H10U11R4D11F2",120
,110,120,30
790 DATA"S8BM125,158E8H3ND6H9U5E
2NR5U2F2R1E2H1U1L2H4E7H3G9F7BU4U
4BU6U4E2A3XR$;A0F2D10F4E9H2L2D2G
4H5D15G1D7F9D4G9L1F3D3L1H6F5D1G2
F1R3F2L11U1E2H2U26",120,110,122,
45
800 DATA"DOUBLE-UPS","FAST CONTI
NUOUS CYCLE"
810 DATA"S12BM120,120U5R15E1R2F1
R16F2R1U4E2D11L1H2G2L55H2A2XR$;A
0E2R13BR3D4G2L10U4R9U3E1R1F1D1R3
F1",130,110,30,115
820 DATA"S12BM120,120U6R1U9E2R15
F2R1U4E2D11L1H2G2L9D10G2L18H9U3N
R2H2E5G3NF1G2H1U4E3R2F3L2D2U2R2D
2F1L1D1G3E2R3F6BR4G7H6E3F4E4R3D1
G1R3",130,110,60,70
830 DATA"S12BM117,90G2U3L4D6F2R1
E4F2D5U5H2E2U1H1L1G1U3H2L4A3XR$;
A0U1E2R17F1E1U3E2D11L1H2G2L10F5D
5G4L8H7U8E2",130,110,100,50
840 DATA"TRIANGLE PUSH-UPS","FOR
EHEAD IN SPACE BETWEEN HANDS"
850 DATA"S12BM110,84D5F1R13BR4U2
L4D9F9R5U1L3H1U1H6U7E2U4XR$;U4H2
L23G7L3G2L7G4L2D11R1E1U6R8E1R7E3
R3E6",40,120,190,85
860 DATA"S12BM110,102D5F1R14BR4U
3L4D7F5R2F1R6U1L3H1L2H4U4E2U4XR$
;U4H2L28G2L6G2L6G3L2D11R1E1U7R1F
1R12E2R10E2",40,120,190,100
870 DATA"S12BM110,120D4F2R8BR6E1
H3G4D1F2R9E1F1R6H1L2H1L2H1L2NL4E
1U4XR$;U4H3L18H1L5G1L20G1L2D11R1
E1U6F2R25E1",40,120,190,120
880 DATA"KANGAROO HOPS","  FAST
AND HIGH"
890 DATA"S8BM116,86R5D35G2F1R3F2
L11U1E2H2U26H2U5E2U20E2A3XR$;A0F
2D17F4R1D1F1G2H10U11R4D11F2",120
,120,115,28
900 DATA"S8BM119,80L3BL2G2D5F12G
7D1G1F6U3H2R1E9U4H9U7E1U18H2L4A3
XR$;A0L4G2D3G6D2F8R1E2H1U1L2H4E6
H3G1BD6D4BD4D2",110,90,112,22
910 DATA"S8BM118,75L5NU2D4F4R3E6
NU3D9G1F7U3H3U2R3U16H3L3G5U12H2L
4A3XR$;A0L4G2D3E2F3G6R5E1D1R1D3L
10H2U2E6",120,80,112,25
920 DATA"CURL-UPS","DON'T SIT-UP
 ...CURL-UP"
930 DATA"S12BM125,171U5NH1U1R6E9
R5F12G2F1R5F2L11U1H9G10L28H2L2G1
NH5G1L4H3U2E3ND2R2ND1E1D1R1F2D4R
3U2R1H1U6D5R4U2NR16U5H3L1G3D7",1
40,160,40,170
940 DATA"S12BM125,171U6NL4R6E9R5
F12G2F1R5F2L11U1H9G10L16H9U2H2L2
NU7H3U4E2R3NG2F1NG1R1D1F1D3G3F2E
1R1U1NE4F3E3NF5E2U4H1L4G4",140,1
60,55,120
950 DATA"S12BM125,162E4NU3F1E9R5
F12G2F1R5F2L11U1H8L1G9L8H5U8E3U3
H1NE5H1U4E3R2F3NL2D2NL1F1L1D1G2L
4D3R2D1E1NR5D4R6E3U1H3L5",140,16
0,120,100
960 PLAY"T20ABCP4ABC":CLS:PRINT:
PRINT"LAY DOWN AND PLACE YOUR FI
NGERS ON YOUR NECK.":PRINT"BEGIN
 COUNTING YOUR HEARTBEATS  WHEN
YOU HEAR THE SOUND."
970 FORX=1TO 3350:NEXT:PLAY"O4V2
5L50ABA":TIMER=0
980 IF TIMER>=900THENPLAY"BCC"EL
SE980
990 RETURN
1000 RESTORE:FOR N=1TO7:READ E$:
NEXTN:FOR N=1TO3:READ E$:FOR M=1
TO4:READ A:NEXT M,N
1010 RETURN
```

Inspired by a "schematic scoundrel," this program is an aid for drawing flow chart diagrams

CoCoflow: CoCocad Expanded

By Dennis Page

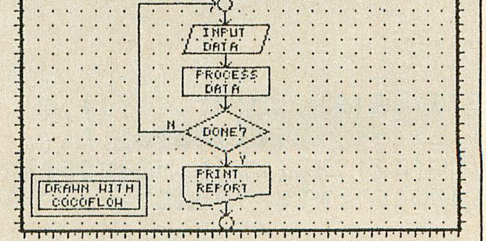
The "mini-CAD" (Computer-Aided Design) program, called *CoCocad*, written by Peter Kerckhoff (THE RAINBOW, October 1985, Page 130) proved to be very interesting. It aids in drawing schematics. The program is icon menu-driven using a mouse, joystick, X-Pad or touch tablet. The keyboard is seldom used.

I am surrounded by expensive three-dimensional color CAD systems at work and because of that, was skeptical of the *CoCocad* utility. However, after typing in the program to learn how graphics pointing and positioning was handled, new uses for *CoCocad* came to mind. How about modifying *CoCocad* to draw flow charts? A typical computer buff could use the same system to draw schematics for computer circuits and draw corresponding software flow charts as well.

To do this, minor modifications to *CoCocad* are needed. The modified program is called *CoCoflow*, and instead of drawing schematic representations of electronic components, it draws flow chart symbols.

On first look, the only difference between the two programs is that the *CoCocad* diode icon has been replaced by a familiar flow diagram symbol, the diamond-shaped decision block. Figure 1 shows a sample *CoCoflow* screen. The differences become apparent when the flow diagram icon is selected. The pull-down menu shows the first flow chart symbol selection: a terminal symbol that begins or ends the flow chart. As the mouse button is pressed, more symbols show up.

Figure 1: Sample *CoCoflow* Screen



To use a symbol, move the cursor to USE in the menu and press the mouse button. The pull-down menu disappears and the selected symbol may be moved to the desired location. These symbols include right, left, up and down

---

Dennis Page is an electronics engineer, consultant and writer based in Los Angeles.

arrows to show flow directions. The arrows may be made longer with the line function, just as *CoCocad* does it.

CoCocad modifications are easily accomplished with the following procedure. Copy *CoCocad* to create the new *CoCoflow* program by using the command:

```
COPY "COCOCAD.BAS" TO "COCOFLOW
.BAS"
```

Then load *CoCoflow* by using the command:

```
LOAD "COCOFLOW"
```

Modify *CoCoflow* by typing in Listing 1. The line numbers are arranged to replace the corresponding *CoCocad* lines, so be sure your copy of *CoCocad* is numbered identically to the listing in the *CoCocad* article. Otherwise, you will have to match up the correct lines for replacement. Line numbers shown alone are line deletions — *CoCoflow* does not need these lines. Be sure to get the line numbers correct, otherwise the wrong lines may be replaced. If you do make a mistake and cannot find the error, just reload *CoCoflow* and start over. When finished, save *CoCoflow* by using the command:

```
SAVE "COCOFLOW"
```

Description of Modifications

Line 120 changes the dimension of variable arrays CM and CO to reflect the larger flow chart symbols for `GET` and `PUT` operations. Line 440 changes the name of the component pull-down menu to symbols and changes the graphics location of the flow chart symbol within the pull-down menu. Line 460 changes the number of selectable symbols and the location of the symbol within the pull-down menu. Lines 470 and 870 also reflect the changes in the number of symbols. Lines 880 through 970 are the `DRAW` strings for the new symbols. Lines 980 through 1110 are deleted because there are fewer symbols. Line 1760 replaces the diode symbol in the icon menu to the diamond-shaped flow chart symbol.

Now try it! You'll see that *CoCoflow* operates just like *CoCocad*, except that you can now draw flow charts.

CoCocad is an excellent example of applying pointing devices, pull-down menus and icon menus to simplify program operation. Reading Peter's commented program listing reveals much. Rewards await the student who uses *CoCocad* as a learning tool.

As Peter had also suggested in his article, if you use *CoCoflow* to draw a flow chart you hope to have published, please put a little note somewhere denoting that *CoCoflow* was used to draw the chart. Any questions regarding these modifications may be directed to me at 14108 Doty Avenue #36, Hawthorne, CA 90250. Please include an SASE. ☐

Editor's Note: The following are modifications to the *CoCocad* program that appeared in "CoCocad: The Schematic Scoundrel" (THE RAINBOW, October 1985) by Peter Kerckhoff. Load *CoCocad*, type in the following lines and save as *CoCoflow*. *CoCoflow* operates just as *CoCocad* except flow chart symbols appear instead of schematic symbols. For your convenience, the above modifications will be incorporated into the *CoCocad* program, and will be included on this month's RAINBOW ON TAPE.

The listing: `COCOFLOW`

```
120 DIM C$(3),A(8),AD(8),C1(1),C
2(1),C3(1),L1(6),L2(6),L3(6),L4(
6),CM(32),CO(32),MD(255),MO(255)
:B$="V31L100O4B":NF$="NONE"

440 T$=" SYMBOLS":GOSUB850:T$="N
EXT   USE":TX=55:TY=115:GOSUB100
:T$="PREV":TX=55:TY=107:GOSUB100
:N=3:GOSUB50:N=1:DRAW"BM56,65":G
OSUB870

460 IF X>80 THEN GET(56,65)-(56+
XW,65+YW),CM,G:PUT(50,50)-(110,1
20),MO,PSET:GOTO480 ELSE DRAW"BM
56,65C5":GOSUB870:DRAW"BM56,65C0
":IF Y<109 THEN 470 ELSE N=N+1:I
F N<11 THEN GOSUB870:GOTO450 ELS
E N=1:GOSUB870:GOTO450

470 N=N-1:IF N>0 THEN GOSUB870:G
OTO450 ELSE N=10:GOSUB870:GOTO45
0

870 ON N GOTO 880,890,900,910,92
0,930,940,950,960,970

880 DRAW"BD7EUEUERERER34FRFRFDFD
FD2GDGDGLGLGL34HLHLHUHUHU":XW=48
:YW=16:RETURN:'TERM

890 DRAW"BD16BRU2EU2EU2EU2EU2EUR
42 D2GD2GD2GD2GD2GDL42":XW=48:YW
=16:RETURN:'I/O

900 DRAW"R48D16L48U16":XW=48:YW=
16:RETURN:'PROCESS

910 DRAW"BD12RERERERERERERERERER
ERERE FRFRFRFRFRFRFRFRFRFRFRFRL
GLGLGLGLGLGLGLGLGLGLGLG HLHLHLHL
HLHLHLHLHLHLHLH":XW=48:YW=25:RET
URN:'DECISION
```

```
920 DRAW"R48D16L8GL5GL3GL3GL3GL4
GL6HL4HL2HUHU16":XW=48:YW=22:RET
URN:'DOCUMENT

930 DRAW"BD3EURER2FRDFD2GDLGL2HL
UHU":XW=9:YW=9:RETURN:'CONN

940 DRAW"BD8BR4NU7NH3E3":XW=8:YW
=8:RETURN:'D-ARROW

950 DRAW"BD4BRE3ND7F3":XW=9:YW=8
:RETURN:'U-ARROW

960 DRAW"BD4R7NH3G3":XW=8:YW=8:R
ETURN:'R-ARROW

970 DRAW"BD4BRNR7NE3F3":XW=9:YW=
8:RETURN:'L-ARROW

980 (delete)

990 (delete)

1000 (delete)

1010 (delete)

1020 (delete)

1030 (delete)

1040 (delete)

1050 (delete)

1060 (delete)

1070 (delete)

1080 (delete)

1090 (delete)

1100 (delete)

1110 (delete)

1760 DRAW"BM4,4R6D12R6 BM24,4R12
D12L12U12 BM43,10E6F6G6H6 BM62,4
R2BR3R2BR3R2D2BD3D2BD3D2L2BL3L2B
L3L2U2BU3U2BU3U2 BM81,4R12L6D12
BM102,4D4NR6GFNR6GFNR6GFND4R6ND4
EHEHEHU4L6 BM119,8ND4R6U4F6G6U4L
6":RETURN
```

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By Bernie Litton

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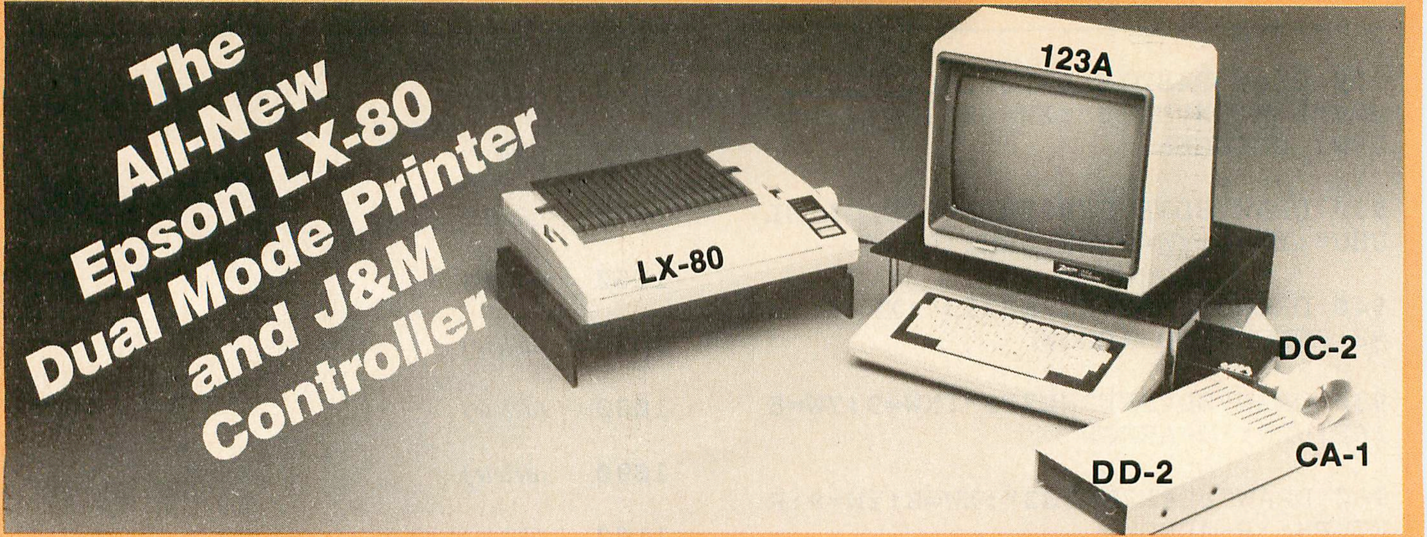
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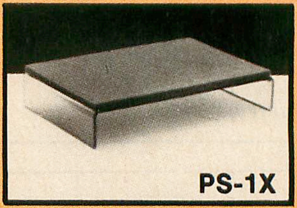

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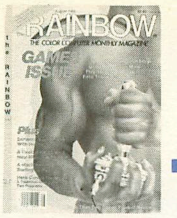

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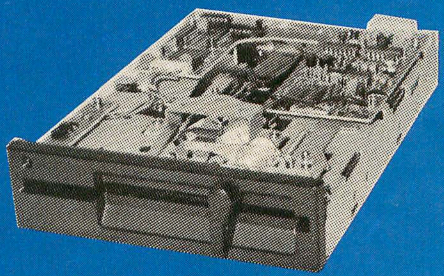

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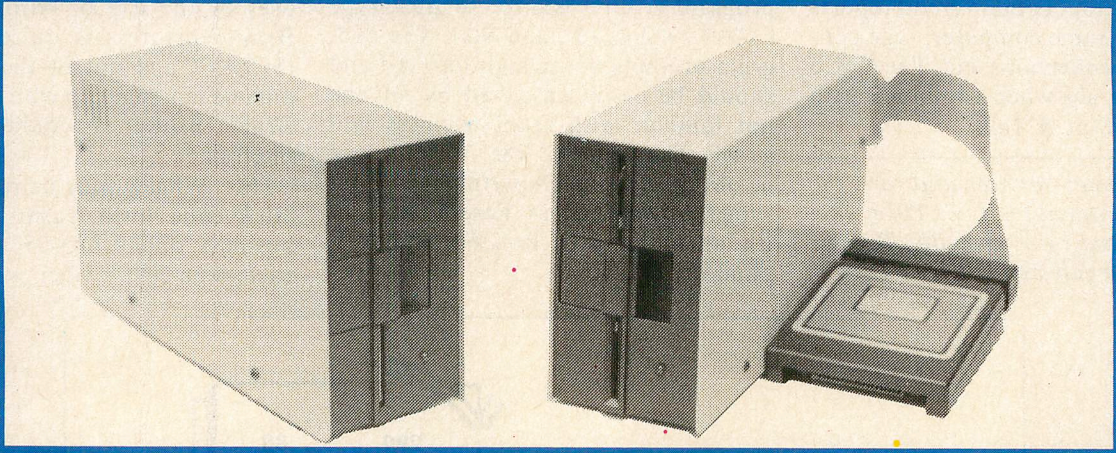

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Determine the amount of early payoff on installment loans

The Rule of 78s

By Clarence Whaley

After having read so many good articles in RAINBOW, I felt obliged to make a small contribution. I am blind and have been a CoCo user for about two years. Among my responsibilities as a credit manager of a retail music store, I obtain credit reports from a mainframe computer, type contracts, make collections, etc. The CoCo is a fantastic aid when combined with the Votrax "Type & Talk."

The "Rule of 78s" formula is used to determine the amount of early pay-off on installment loans and eliminates the use of charts. The *Rule of 78s* program is written in two forms: a one-line version and a multiline version. This program is quite simple to use. Type `CLOAD "RULE 78"` and `RUN`. The program prompts are straightforward and should be easily answered by anyone not familiar with retail business language. The "Rule of 78s" formula can be obtained from: Department of Consumer Affairs, Federal Reserve Bank of Philadelphia, P.O. Box 66, Philadelphia, PA 19105.

With the use of a simple screen dump program, I have instant access to accounts receivable, etc. But this is a slow process. I would like to hear from other blind CoCo users to compare notes with them on more rapid access and business uses of the CoCo. Also, the cost of Braille printers is quite prohibitive ($15,000) and out of the question! If anyone has come up with an affordable Braille printer, I would certainly be interested.

(Mr. Whaley may be reached at 123 8th Avenue North, Nashville, TN 37203, business phone 615-254-6533. Please enclose an SASE when writing. ☐

Clarence Whaley services and runs the Credit Department for L.C. Tiller, Inc. (Music Company) in Nashville, Tennessee. His Ham call sign is KD4PT.

290 88
END 13

The listing: `RULEOF78`

```
100 TEXT$="":GOSUB440
110 TEXT$="":GOSUB440
120 TEXT$="THIS PROGRAM FIGURES"
:GOSUB440
130 TEXT$="THE EARLY PAY-OFF OF"
:GOSUB450
140 TEXT$="INSTALLMENT LOANS USI
NG":GOSUB450
150 TEXT$="THE RULE OF 78'S":GOS
```

```
UB450
160 TEXT$="":GOSUB450
170 TEXT$="SOME COMPANIES MAY HA
VE AN":GOSUB450
180 TEXT$="ADDITIONAL CHARGE FOR
 ":GOSUB450
190 TEXT$="EARLY PAY-OFF WHICH":
GOSUB450
200 TEXT$="IS NOT PART OF THIS F
ORMULA":GOSUB450
210 TEXT$="":GOSUB450
220 TEXT$="PRESS ANY KEY TO BEGI
N":GOSUB450
230 A$=INKEY$
240 IFA$=""THEN230ELSE250
250 CLS:INPUT"TOTAL MONTHS OF CO
NTRACT";N
260 SOUND200,1
270 A=(N/2*(N+1))
280 INPUT"HOW MANY MONTHS REMAIN
";B
290 SOUND200,1
300 C=(B/2*(B+1))
310 D=C/A
320 INPUT"TOTAL INTEREST CHARGE"
;E
330 SOUND200,1
340 F=(E*D)
350 PRINT
360 INPUT"CURRENT BALANCE DUE";G
370 SOUND200,1
380 H=G-F
390 PRINT"THE REBATE IS":PRINT@1
81,USING"####.##";F
400 SOUND200,1
410 PRINT"THE PAY-OFF IS":PRINT@
213,USING"####.##";H
420 SOUND200,1
430 END
440 CLS
450 M=LEN(TEXT$)
460 FOR X=1 TO M
470 PRINT@32*L+15-M/2+X,MID$(TEX
T$,X,1)
480 NEXT X
490 L=L+1
500 SOUND200,1
510 RETURN
520 'CLARENCE WHALEY
530 '123 8TH AVENUE NORTH
540 'NASHVILLE, TN 37203
550 'PHONE: 615-254-6533
```

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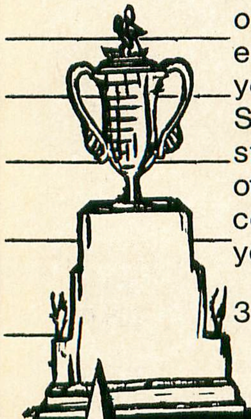
SPEED RACER

by Steven Hirsch



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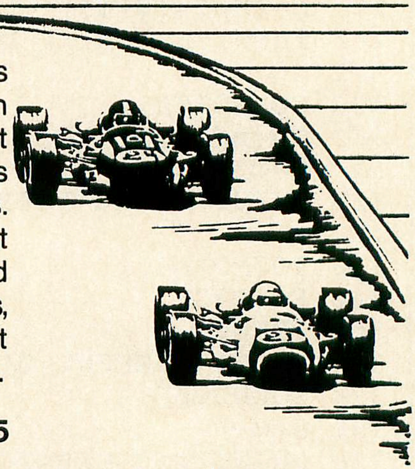

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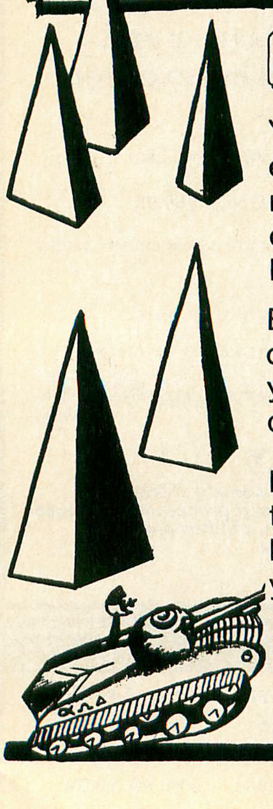
ROMMEL 3-D

By Kary McFadden



You clutch the tank controls, searching for any sign of the enemy. Suddenly a blip appears on radar! Frantically, you move your tank into position. At last you spot the elusive enemy tank! Facing it, you race to lock sights and fire before he does!

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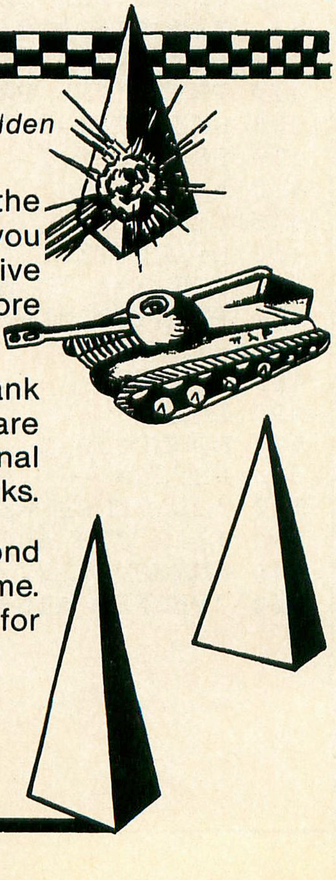

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A Simple Technique for Creating Animation

By Joseph Kolar
Rainbow Contributing Editor

Animation gives any CoCo graphics program a lot of pizazz with the illusion of movement. The technique of creating animation seems beyond the capability of the newcomer to CoColand. It is not the formidable project that it appears to be.

The good news is that the beginner need not be overwhelmed by animation creation. He can do it with a minimum of artistic talent. Today, we are going to make like we are Rembrandts, and do some simple but satisfying animation. Using artistic license, we will create a "stick bird." We will take this bird, set it in flight and give it a chance to soar on our screen. We will create various stick shapes to add variety and give the appearance of graceful flight.

Look at Listing 1 and key in lines 10 and 1000. `PCLS3` gives us the background blue sky upon which the bird is highlighted. Key in lines 20 to 27, the eight forms of the bird we will use in our effort to animate. They are called by the variables assigned them. The reason we use various forms of the bird is to create the illusion of a change in the bird as it wheels, soars or just flaps its wings.

If we use just one shape throughout (one variable), the bird looks stiff and its flight stilted.

Key in Line 30. All the birds are displayed using the `DRAW` statement. The color, horizontal and vertical locations are included within quote marks. The desired bird shape is selected by picking the desired variable and added with the good old concatenation marker, '+'. Now `RUN` and you should be suitably unimpressed to see what is supposed to be a bird. Press BREAK and, one at a time, substitute the other variables in Line 30 to see the so-called birds in our repertoire. After you have seen them all, replace the original variable, B$.

Keep in mind that there are many ways to develop animation. The following system is somewhat unwieldy, but lends itself admirably for the purpose of this tutorial.

Run the program and note that we place a bird, in color C2, at both a horizontal and vertical location of 10. The bird (B$ in this case), has the left wing "up" and the right wing in a horizontal plane. At this time, also note that in lines 40 through 350, the color (C2) is redundantly included in every `DRAW` statement. In Listing 1 only the first C2 in Line 30 is required to maintain the same color of the bird. CoCo knows that C2 is desired in all the subsequent `DRAW` lines. At a later stage in our artistic endeavors, it will be necessary to insert C2 in all of the `DRAW` lines in this listing. To save a lot of time and monotonous editing later on, we will put them in as we proceed.

At this stage, we will place the various-shaped birds at locations we deem either logical or interesting, one at a time, ever increasing the number of birds in the flight plan. Press BREAK, key in Line 40 and `RUN`. You will see a second bird form on the screen (A$), with both wings in the "up" position. We moved it over to the right five units, to 15 on the horizontal, and 10 units down on the vertical. We now have two birds on the screen.

For the purpose of this tutorial, we will move either zero, five or 10 units from a previous location. This creates a smooth transition from one location to the next.

Press BREAK, key in Line 50 and run. The same 'V' bird is flying to the right. Comparing lines 40 and 50 in the listing, you can verify that we moved the bird 10 units to the right. Press BREAK, key in Line 60 and run. You can see the same bird heading to the right.

Don't get excited if the birds overlap on the screen. It will all be sorted out later. At this stage, we are plotting the

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Florida-based Joseph Kolar is a veteran writer and programmer and specializes in introducing beginners to the powers of CoCo.

flight path and want to see every shape and its location as we create it. This way you can locate a desired shape at the location you feel is right. If you don't like the shape or location, it can be altered now without disturbing future additions to the flight plan. You won't have to dissect your program and wearily rearrange it later.

We are so creative that we plot our animation program directly on the screen. However, you may use graph paper if you wish to determine the shapes and locations of the birds.

Press BREAK, key in Line 70 and run. Here I promptly violated my own rule and dropped the bird, B$, 15 units. I had a down draft in mind, which I imagined might cause the bird to drop more than usual and change directions by going five units to the right.

Press BREAK, key in Line 80 and run. Here the bird, E$, is wheeling to the right and down; press BREAK again.

If you have difficulty viewing a shape that is superimposed over a previous shape, temporarily mask the previous line with a `REM` marker. `RUN` to see if it is what you intended, then remove the `REM` marker from the previous line. At this point, key in each program line one at a time, and check to see what shape you added where.

We have completed our first phase: creating, locating and displaying each bird. Now that we have created each bird in our tableau, we have to make them vanish. Beginning with the bird at Line 30 through the last one at Line 350, we will erase them. `LIST 30` and add +5 to Line 30 to create the "erase" line. Thus, all program lines used to erase the birds will end in '5'. Key in 35, the line number, and copy the data appearing in Line 30 that you have on the screen changing only the digit (2) in C2 to '3'. Now run. C3 is the same color as `PSCL3`. The bird is still, invisible and effectively erased.

If you care to check this out, temporarily change `PCLS3` to `PCLS2` in Line 10 and `RUN`. See? Restore Line 10 to its original state.

Press BREAK and `LIST40`. Create Line 45 and copy the scoop in Line 40, making the desired color change. Proceed line by line, every once in a while pausing to `RUN` and make sure you have erased all the birds. If some residue remains on the screen, you made a booboo in copying! When you check, you will be excited to see the vestiges of a bird in flight, if ever so fleetingly.

When you have finished the second phase and check out your work, you should get a fleeting glimpse of the bird in motion and end up with a blank, blue display.

Obviously, we must create pauses between the creation and disappearance of each bird so ordinary mortals can observe the flight. The third phase determines the length of time each bird is visible. We will use a pause routine to accomplish this feat: `FOR Z= 1 TO X: NEXT`, where 'X' is some value between 75 and 200. We will use increments of 25, so for 'X' we will use the following values: 75, 100, 125, 150, 175 and 200 to keep it simple and under control.

After you get the idea, you can substitute your values for the chosen ones in the listing to make it fly the way you want it to fly. First, let me give you the system we will use in this tutorial.

Type in `LIST 30-40`. We list two lines to see how far the bird moved. We note that the bird moved 10 units down and five units to the right. We compare either Line 30 or 35 to Line 40. We will place the pause line immediately following the creation line (Line 30). Each pause line will be numbered by incrementing the creation line by +1 and the erase line by +5. We will try 100 as the length of the pause. Key in `31 FOR Z=1TO100:NEXT` and run. You can't see much! Press BREAK, `LIST40-50` and let's make this pause line shorter in duration by using 75. Key in `41 FOR Z=1TO75:NEXT` and run, then press BREAK and `LIST50-60`. We'll use 100. Key in `51 FOR Z=1TO100:NEXT`.

Follow the same procedure using 150 in Line 61, 100 in Line 71 and 75 at both lines 81 and 91. `RUN` and observe the movement. Press BREAK and adjust it to suit yourself. It is your bird! Make it fly as you would imagine it should fly. Vary the time lapse, preferably a higher figure for a large location displacement and a shorter lapse for a small movement, but do it from one line to the next in a methodical manner, ensuring that all previously determined time pause lines are satisfactory. You may compare the pauses you chose with the ones in Listing 2.

You may want the movement to be quicker so it looks even more natural. If so, lower the value of each pause line by 25 or 50 units. For that matter, you may prefer to substitute other shapes (bird variables). Be my guest! When this phase of the program is completed and all the pauses are set, you may want to change Line 1000 (`1000 GOTO10`).

Since many of your pause lines are repetitious, this is an ideal occasion to use `GOSUB`. For instance, add `400 FOR Z=1TO75:NEXT:RETURN` and change lines 41, 81, 91, 141, 221, 231, 241, 251, 261, 281, 291, 301, 311, 321 and 341 to `GOSUB400`. You will have to put in a line, `360 GOTO10` or `360 GOTO1000`, to walk around the `GOSUB` routine. Ideally, the `GOSUB` should be at the end of the program, for example, Line 2000. However, using 400 instead of 2000 saves typing one extra zero and whatever error that third zero might generate due to typing mistakes. Naturally, you can make other `GOSUB` lines to accommodate frequently-used pause lines.

OK, what have we wrought? Nothing much! Just a bunch of lines flapping across the screen. But, you learned a lot quite painlessly. Let us recap:

1) A picture, design or shape must be created. It can be elaborate or as mindlessly simple as our bird. After it is created and put into a variable form, it can be called using `DRAW`. Alternate shapes should be created in anticipation of need, but they can be created as required and added to the list of shapes.

2) It must be located at the desired site on the screen in a color other than the background.

3) It must remain on the screen for a certain length of time.

4) It must be erased by creating the same design and in the exact location but using the background color so it appears to vanish.

5) The same picture or a variant, again created and called as a variable in a `DRAW` statement, can be placed in a newly selected location. Repeat steps two through four. Suppose you made a pastoral scene in the blank space reserved under the bird? Or the outline of a few buildings?

Now that you know how to make a bird fly around, you can use the same technique to produce your own creation.

As an added attraction, Listing 3 uses `SOUND` as a timer and has a skyline thrown in to show how to enhance the animation. You can modify your tutorial program by inserting lines 11-13, modify Line 1000 and change all pause lines to `SOUND` lines. If you don't care for my sounds, make up your own.

Finally, based on this tutorial, a mindless graphic is designed wherein bats, ad nauseam, put windows in the buildings. □

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130 63
END 54

Listing 1: BIRDS

```
0 'LISTING1
10 PMODE3,1:PCLS3:SCREEN1,0
20 A$="F6E6"
21 B$="F6R6"
22 C$="R6E6"
23 D$="E6F6"
24 E$="F12"
25 F$="E12"
26 G$="R12"
27 H$="R6F6"
30 DRAW"C2BM10,10"+B$
40 DRAW"C2BM15,20"+A$
50 DRAW"C2BM25,20"+A$
60 DRAW"C2BM35,20"+A$
70 DRAW"C2BM40,35"+B$
80 DRAW"C2BM50,40"+E$
90 DRAW"C2BM60,45"+B$
100 DRAW"C2BM70,45"+A$
110 DRAW"C2BM75,55"+A$
120 DRAW"C2BM85,60"+A$
130 DRAW"C2BM90,70"+A$
140 DRAW"C2BM95,75"+C$
150 DRAW"C2BM110,90"+D$
160 DRAW"C2BM120,90"+D$
170 DRAW"C2BM130,95"+D$
180 DRAW"C2BM140,95"+C$
190 DRAW"C2BM150,95"+F$
200 DRAW"C2BM140,80"+A$
210 DRAW"C2BM130,75"+A$
220 DRAW"C2BM120,70"+A$
230 DRAW"C2BM120,60"+A$
240 DRAW"C2BM120,50"+A$
250 DRAW"C2BM125,45"+B$
260 DRAW"C2BM120,40"+E$
270 DRAW"C2BM125,35"+E$
280 DRAW"C2BM130,25"+A$
290 DRAW"C2BM135,20"+A$
300 DRAW"C2BM140,15"+A$
310 DRAW"C2BM145,15"+C$
320 DRAW"C2BM145,10"+G$
330 DRAW"C2BM150,10"+H$
340 DRAW"C2BM160,10"+D$
350 DRAW"C2BM160,5"+D$
1000 GOTO1000
```

75 120
190 247
270 52
END 116

Listing 2: FLIGHT 1

```
0 '<LISTING2>
1 'CREATED BY J. KOLAR, 1985
10 PMODE3,1:PCLS3:SCREEN1,0
20 A$="F6E6"
21 B$="F6R6"
22 C$="R6E6"
23 D$="E6F6"
24 E$="F12"
25 F$="E12"
26 G$="R12"
27 H$="R6F6"
30 DRAW"C2BM10,10"+B$
31 FOR Z=1TO100:NEXT
35 DRAW"C3BM10,10"+B$
40 DRAW"C2BM15,20"+A$
41 FOR Z=1TO75:NEXT
45 DRAW"C3BM15,20"+A$
50 DRAW"C2BM25,20"+A$
51 FOR Z=1 TO 100:NEXT
55 DRAW"C3BM25,20"+A$
60 DRAW"C2BM35,20"+A$
61 FOR Z=1 TO 150:NEXT
65 DRAW"C3BM35,20"+A$
70 DRAW"C2BM40,35"+B$
71 FOR Z=1TO100:NEXT
75 DRAW"C3BM40,35"+B$
80 DRAW"C2BM50,40"+E$
81 FORZ=1TO75:NEXT
85 DRAW"C3BM50,40"+E$
90 DRAW"C2BM60,45"+B$
```

E.T.T. Electronic Typing Teacher
by CHERRYSoft

Learning to type the right way can save you hours of tedious work when entering programs into your CoCo, and this is just what ETT was designed to do. Devote a little time every day practicing with ETT and before you know it you will be typing with confidence. Entering those programs will no longer be the chore it use to be.

ETT's video keyboard lets you practice with all the keys labeled, all the keys blank or only the "home" keys labeled. The visual cues guide you while you learn to type without watching your fingers. ETT shows your accuracy, response time, and words per minute. You will quickly see that you are improving with practice.

With the sentences provided by ETT learning to type can be fun. Over 1000 variations chosen because they include every letter in the alphabet. You can also create your own practice sets. This outstanding program was written by a certified teacher and professional programmer and comes with a ten page student manual-study guide. Requires 16K Extended Basic.

Cassette $24.95 FREE SHIPPING Disk $29.95

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LABEL64 - LABEL64 is a name and address file/print system that takes advantage of your 64K. You can develop and maintain a mailing list. Print lists or mailing labels in your choice of 1, 2, or 3 wide. Supports 3 or 4 line addresses with phone optional. You can sort by last name, first name, and/or zip code. You can work with up to 300 records in memory at a time. We include a second copy for back up at no additional charge. Take advantage of your 64K with LABEL64.
Cassette - 64K EXT Postpaid $24.95

FILE64 - FILE64 is a data management system designed to take advantage of a 64K machine. You can create and maintain records on anything you choose. Recipes, coupons, household records, financial records - you name it. You create records containing up to five fields you define. You can search, sort, modify, add, delete, save on tape, display on the screen and print on a printer. The program could cost you much more and we include a back up copy at no additional charge.
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SAVE $$ Take both our LABEL64 and FILE64 for only $40.00 Postpaid. Don't miss this special offer!

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Canadian dealers may contact Kelly Software Dist. LTD. P.O. Box 11932 Edmonton, Alberta T5J 3L1

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16K EXT Postpaid Disk $21.95 Cassette $19.95

PROGRAM FILE - (rev Oct 83 Rainbow) Organize your programs. With PROGRAM FILE you create a file of your computer programs. You can search, sort, add, modify, delete, save to tape and display on the screen or send to a printer.
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```
91 FOR Z=1TO 75:NEXT
95 DRAW"C3BM60,45"+B$
100 DRAW"C2BM70,45"+A$
101 FOR Z=1TO150:NEXT
105 DRAW"C3BM70,45"+A$
110 DRAW"C2BM75,55"+A$
111 FOR Z=1TO125:NEXT
115 DRAW"C3BM75,55"+A$
120 DRAW"C2BM85,60"+A$
121 FOR Z=1 TO 125:NEXT
125 DRAW"C3BM85,60"+A$
130 DRAW"C2BM90,70"+A$
131 FOR Z=1TO75:NEXT
135 DRAW"C3BM90,70"+A$
140 DRAW"C2BM95,75"+C$
141 FOR Z=1TO175:NEXT
145 DRAW"C3BM95,75"+C$
150 DRAW"C2BM110,90"+D$
151 FOR Z=1TO100:NEXT
155 DRAW"C3BM110,90"+D$
160 DRAW"C2BM120,90"+D$
161 FOR Z=1TO100:NEXT
165 DRAW"C3BM120,90"+D$
170 DRAW"C2BM130,95"+D$
171 FOR Z=1 TO 125:NEXT
175 DRAW"C3BM130,95"+D$
180 DRAW"C2BM140,95"+C$
181 FORZ=1TO125:NEXT
185 DRAW"C3BM140,95"+C$
190 DRAW"C2BM150,95"+F$
191 FOR Z=1TO 175:NEXT
195 DRAW"C3BM150,95"+F$
200 DRAW"C2BM140,80"+A$
201 FOR Z=1TO125:NEXT
205 DRAW"C3BM140,80"+A$
210 DRAW"C2BM130,75"+A$
211 FOR Z=1TO100:NEXT
215 DRAW"C3BM130,75"+A$
220 DRAW"C2BM120,70"+A$
221 FORZ=1TO75:NEXT
225 DRAW"C3BM120,70"+A$
230 DRAW"C2BM120,60"+A$
231 FOR Z=1TO75:NEXT
235 DRAW"C3BM120,60"+A$
240 DRAW"C2BM120,50"+A$
241 FOR Z=1TO75:NEXT
245 DRAW"C3BM120,50"+A$
250 DRAW"C2BM125,45"+B$
251 FOR Z=1TO75:NEXT
255 DRAW"C3BM125,45"+B$
260 DRAW"C2BM120,40"+E$
261 FOR Z=1TO75:NEXT
265 DRAW"C3BM120,40"+E$
270 DRAW"C2BM125,35"+E$
271 FOR Z=1 TO 100:NEXT
275 DRAW"C3BM125,35"+E$
280 DRAW"C2BM130,25"+A$
281 FOR Z=1TO75:NEXT
285 DRAW"C3BM130,25"+A$
290 DRAW"C2BM135,20"+A$
291 FORZ=1TO75:NEXT
295 DRAW"C3BM135,20"+A$
300 DRAW"C2BM140,15"+A$
301 FOR Z=1TO 75:NEXT
305 DRAW"C3BM140,15"+A$
310 DRAW"C2BM145,15"+C$
311 FOR Z=1TO75:NEXT
315 DRAW"C3BM145,15"+C$
320 DRAW"C2BM145,10"+G$
321 FOR Z=1TO 75:NEXT
325 DRAW"C3BM145,10"+G$
330 DRAW"C2BM150,10"+H$
331 FOR Z=1TO125:NEXT
335 DRAW"C3BM150,10"+H$
340 DRAW"C2BM160,10"+D$
341 FOR Z=1TO 75:NEXT
345 DRAW"C3BM160,10"+D$
350 DRAW"C2BM160,5"+D$
351 FOR Z=1TO200:NEXT
355 DRAW"C3BM160,5"+D$
1000 GOTO10
```

```
70 ........97
171 .......37
260 ......144
END .....203
```

Listing 3: FLIGHT 2

```
0 '<LISTING3>
1 ' CREATED BY J. KOLAR, 1985
10 PMODE3,1:PCLS3:SCREEN1,0
11 DRAW"C1BM0,140R40D10R10U90R10
D30R50D50R40U40R10D40R10U90R40D1
00R10U10R10D10R10U40R20BD50L255"
12 PAINT(5,145),2,1
13 PAINT(5,190),1,1
20 A$="F6E6"
21 B$="F6R6"
22 C$="R6E6"
23 D$="E6F6"
24 E$="F12"
25 F$="E12"
26 G$="R12"
27 H$="R6F6"
30 DRAW"C2BM10,10"+B$
31 SOUND125,3
35 DRAW"C3BM10,10"+B$
40 DRAW"C2BM15,20"+A$
41 SOUND 89,2
45 DRAW"C3BM15,20"+A$
50 DRAW"C2BM25,20"+A$
51 SOUND125,3
55 DRAW"C3BM25,20"+A$
60 DRAW"C2BM35,20"+A$
```

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- CREDIT CARD INVENTORY — If you lost your wallet/purse tomorrow, who would you contact, and with what information? Elite•Home would remember.
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EXCEPTIONAL VALUE
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- CHECKS — At tax time, do you go back through your check book and total checks for donations? What about the total for medical expenses? With data from your checks stored on Elite•Home, you can quickly select any grouping of checks for a display and total.

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NEW!

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Elite•Desk brings a calculator, calendar, note pad, and ASCII table to your Color Computer. You can use Elite•Desk by itself, or have it run co-resident with any program in the Elite Software series. Imagine being able to "pull down" a calendar or calculator while typing text on Elite•Word, saving notes while using Elite•Calc, or "calling-up" an ASCII table while working on a Basic program. We've made Elite•Desk fully re-locatable so you can try it with other programs as well. Whether you use Elite•Desk by itself, or along-side another program, it's a valuable addition to your software library. Remember, if you've ever reached for a calculator, calendar, or note pad while using your Color Computer . . . then you need Elite•Desk.

☑ CALCULATOR — Full featured, with all standard functions . . . plus 3 memories. Also works in HEX as an added feature for programmers.

☑ CALENDAR — Shows all days in any month. Lets you "scroll" through months and years with the arrow keys.

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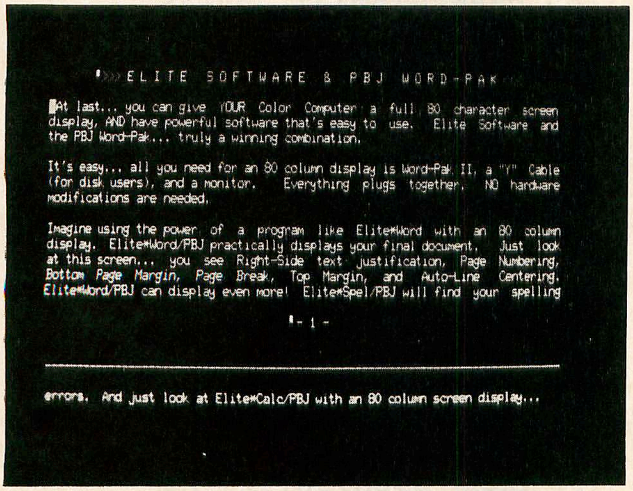

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                                 *- 1 -

________________________________________________________________________________

errors.  And just look at Elite*Calc/PBJ with an 80 column screen display...
```

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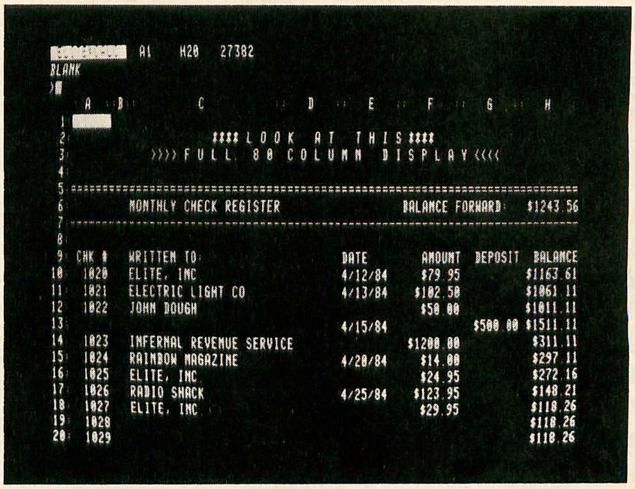

```
            A1    H20   27382
BLANK
>
     A   B         C               D      E      F      G      H
 1
 2                    ####LOOK AT THIS####
 3                >>>>FULL 80 COLUMN DISPLAY<<<<
 4
 5 =============================================================================
 6        MONTHLY CHECK REGISTER                     BALANCE FORWARD:   $1243.56
 7 -----------------------------------------------------------------------------
 8
 9  CHK #   WRITTEN TO                    DATE        AMOUNT  DEPOSIT   BALANCE
10   1020   ELITE, INC                    4/12/84     $79.95            $1163.61
11   1021   ELECTRIC LIGHT CO             4/13/84    $102.50            $1061.11
12   1022   JOHN DOUGH                                $50.00            $1011.11
13                                        4/15/84             $500.00   $1511.11
14   1023   INFERNAL REVENUE SERVICE                $1200.00             $311.11
15   1024   RAINBOW MAGAZINE              4/20/84     $14.00             $297.11
16   1025   ELITE, INC                                $24.95             $272.16
17   1026   RADIO SHACK                   4/25/84    $123.95             $148.21
18   1027   ELITE, INC                                $29.95             $118.26
19   1028                                                                $118.26
20   1029                                                                $118.26
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- **Write self-modifying programs**
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```
61 SOUND159,2
65 DRAW"C3BM35,20"+A$
70 DRAW"C2BM40,35"+B$
71 SOUND125,3
75 DRAW"C3BM40,35"+B$
80 DRAW"C2BM50,40"+E$
81 SOUND89,2
85 DRAW"C3BM50,40"+E$
90 DRAW"C2BM60,45"+B$
91 SOUND89,3
95 DRAW"C3BM60,45"+B$
100 DRAW"C2BM70,45"+A$
101 SOUND159,2
105 DRAW"C3BM70,45"+A$
110 DRAW"C2BM75,55"+A$
111 SOUND133,2
115 DRAW"C3BM75,55"+A$
120 DRAW"C2BM85,60"+A$
121 SOUND133,2
125 DRAW"C3BM85,60"+A$
130 DRAW"C2BM90,70"+A$
131 SOUND89,2
135 DRAW"C3BM90,70"+A$
140 DRAW"C2BM95,75"+C$
141 SOUND89,2
145 DRAW"C3BM95,75"+C$
150 DRAW"C2BM110,90"+D$
151 SOUND125,2
155 DRAW"C3BM110,90"+D$
160 DRAW"C2BM120,90"+D$
161 SOUND125,2
165 DRAW"C3BM120,90"+D$
170 DRAW"C2BM130,95"+D$
171 SOUND125,2
175 DRAW"C3BM130,95"+D$
180 DRAW"C2BM140,95"+C$
181 SOUND133,2
185 DRAW"C3BM140,95"+C$
190 DRAW"C2BM150,95"+F$
191 SOUND170,2
195 DRAW"C3BM150,95"+F$
200 DRAW"C2BM140,80"+A$
201 SOUND133,2
205 DRAW"C3BM140,80"+A$
210 DRAW"C2BM130,75"+A$
211 SOUND 125,2
215 DRAW"C3BM130,75"+A$
220 DRAW"C2BM120,70"+A$
221 SOUND89,2
225 DRAW"C3BM120,70"+A$
230 DRAW"C2BM120,60"+A$
231 SOUND89,2
235 DRAW"C3BM120,60"+A$
240 DRAW"C2BM120,50"+A$
241 SOUND89,2
245 DRAW"C3BM120,50"+A$
250 DRAW"C2BM125,45"+B$
251 SOUND89,2
255 DRAW"C3BM125,45"+B$
260 DRAW"C2BM120,40"+E$
261 SOUND89,2
265 DRAW"C3BM120,40"+E$
270 DRAW"C2BM125,35"+E$
271 SOUND125,2
275 DRAW"C3BM125,35"+E$
280 DRAW"C2BM130,25"+A$
281 SOUND89,2
285 DRAW"C3BM130,25"+A$
290 DRAW"C2BM135,20"+A$
291 SOUND89,2
295 DRAW"C3BM135,20"+A$
300 DRAW"C2BM140,15"+A$
301 SOUND89,2
305 DRAW"C3BM140,15"+A$
310 DRAW"C2BM145,15"+C$
311 SOUND 89,2
315 DRAW"C3BM145,15"+C$
320 DRAW"C2BM145,10"+G$
321 SOUND89,2
325 DRAW"C3BM145,10"+G$
330 DRAW"C2BM150,10"+H$
331 SOUND133,2
335 DRAW"C3BM150,10"+H$
340 DRAW"C2BM160,10"+D$
341 SOUND89,2
345 DRAW"C3BM160,10"+D$
350 DRAW"C2BM160,5"+D$
351 SOUND 176,2
355 DRAW"C3BM160,5"+D$
1000 FOR Z=1 TO 1000:NEXT:GOTO10
```

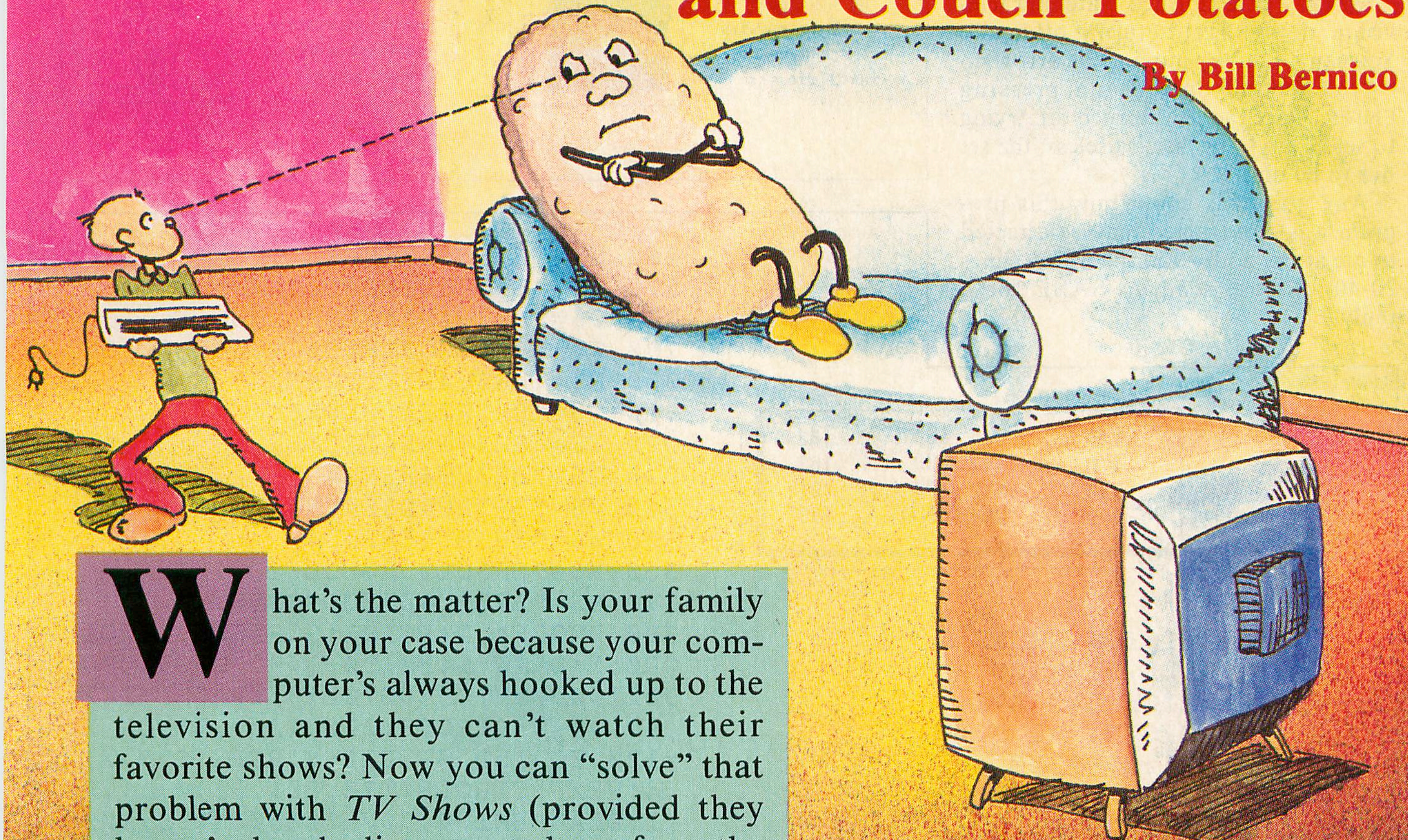
Listing 4: BATS

```
0 '<BATS>
1 ' (C) 1985, J. KOLAR
10 PMODE3,1:PCLS3:SCREEN1,0
11 DRAW"C1BM0,135R44D10R6U90R10D
30R50D50R40U40R10D40R10U90R40D10
0R10U10R10D10R10U40R20BD54L255"
12 PAINT(5,145),2,1
13 PAINT(5,190),1,1
20 A$="F6E6"
23 D$="E6F6"
30 DRAW"C2BM=X;,=Y;"+A$
32 GOSUB100
35 DRAW"C3BM=X;,=Y;"+A$
40 DRAW"C2BM=X ;,=Y ;"+D$
42 GOSUB100
45 DRAW"C3BM=X;,=Y;"+D$
50 DRAW"C2BM=X;,=Y;"+A$
52 GOSUB100
55 DRAW"C3BM=X;,=Y;"+A$
60 DRAW"C2BM=X;,=Y;"+D$
62 GOSUB100
65 DRAW"C3BM=X;,=Y;"+D$
70 X=RND(25)*10-10:Y=RND(15)*10
71 GOTO30
100 FOR Z=1TO10:NEXT:RETURN
```

We interrupt this program for an important announcement . . .

A Peace Treaty for Computer Hackers and Couch Potatoes

By Bill Bernico



What's the matter? Is your family on your case because your computer's always hooked up to the television and they can't watch their favorite shows? Now you can "solve" that problem with *TV Shows* (provided they haven't already disconnected you from the tube).

Actually "solve" is not quite accurate. Though this program doesn't truly solve that very real dilemma, it does offer a tongue-in-cheek response to it by using the CoCo's sound and graphics capabilities.

Upon running the program you'll see a familiar sight — a television set. Along the left side of the screen you are presented with a list of nine choices. The last seven are things to watch on the TV and the first two are options that allow you to either turn the television on or off. Your choice

---

Bill Bernico is a self-taught computerist who enjoys golf, music and programming. He is a drummer with a rock band and lives in Sheboygan, Wisconsin.

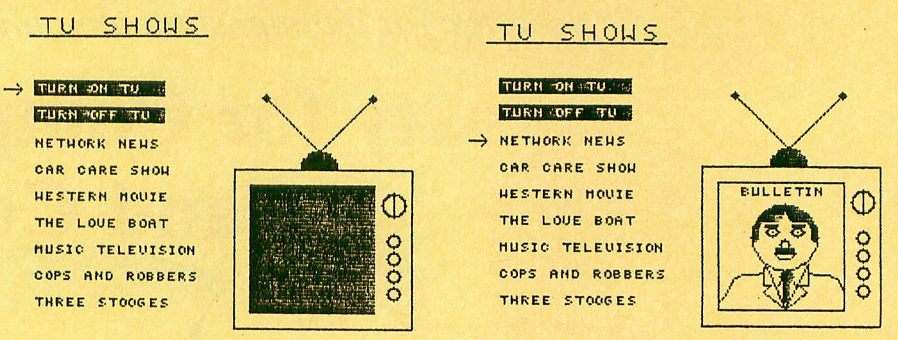
is selected by using the up and down arrows. When you have chosen your option, press ENTER.

What! You selected a television show but nothing happened? Did you remember to turn the set on? Just as in real life, you can't watch anything until you first turn on the TV. Move the arrow to the top and press ENTER. Now the set's on and you can go ahead and select a program.

When you're finished watching television, don't forget to turn it off again. You can do this by moving the arrow up to the second option and pressing ENTER. Once the set is turned off, trying to select anything else is useless; the set has to be on first.

Any questions about how this program was constructed may be directed to me at my address in the listing (lines 20-40). Please send an SASE for a reply. ☐

Sample Printouts


TU SHOWS
TURN ON TU
TURN OFF TU
NETWORK NEWS
CAR CARE SHOW
WESTERN MOVIE
THE LOVE BOAT
MUSIC TELEVISION
COPS AND ROBBERS
THREE STOOGES
TU SHOWS
TURN ON TU
TURN OFF TU
NETWORK NEWS
CAR CARE SHOW
WESTERN MOVIE
THE LOVE BOAT
MUSIC TELEVISION
COPS AND ROBBERS
THREE STOOGES
BULLETIN

240	22	680	83
410	117	730	163
530	112	770	21
640	205	END	153

The listing: TV SHOWS

```
10 'TELEVISION SHOWS
20 'BY BILL BERNICO
30 '708 MICHIGAN AVE.
40 'SHEBOYGAN, WI 53081
50 '(414) 459-7350
60 '
70 CLEAR 500
80 SP$="BR6
90 PD$="BR3R
100 WA$="F2R2E2UDF2R2E2UDF2R2E2U
DF2R2E2UDF2R2E2UDF2R2E2UDF2R2E2U
DF2R2E2UDF2R2E2UDF2R2E2UDF2R2E2U
DF
110 N1$="BR3NU4
120 N3$="BR3R3U2NL2U2NL3BD4
130 A$="BR3U3ERFDNL3D2
140 B$="BR3U4R2FGNL2FGL2BR3
150 C$="BR4REGLHU2ERFBD3
160 D$="BR3U4R2FD2GL2BR3
170 E$="BR3NR3U2NR2U2R3BD4
180 F$="BR3U2NR2U2R3BD4
190 G$="BR3BU4BR3L2GD2FREULBR2BD
2
200 H$="BR3U4D2R3U2D4
210 I$="BR3R2LU4NLRBD4
220 J$="BR3BUFREU3LR2BD4
230 K$="BR3U2RNF2NE2LU2BR3BD4
240 L$="BR3NR3U4BR3BD4
250 M$="BR3U4FRED4
260 N$="BR3U4F3DNU4
270 O$="BR3BUU2ERFD2GLNHBR
280 P$="BR3U4R2FGL2BR2BD2
290 Q$="BR3BUU2ERFD2GNUNRLHBR3BD
300 R$="BR3U4R2FGL2RF2
310 S$="BR3R2EHLHER2BD4
320 T$="BR3BU4R4L2D4BR
330 U$="BR3NU4R3NU4
340 V$="BR3BU4D3FRENU3BD
350 W$="BR3NU4ERFNU4
360 X$="BR3UE2UDGHUDF2D
370 Y$="BR3BU4DFEUDGD2BR
380 PMODE4,1:PCLS1:SCREEN1,1:COL
OR0,1:DRAW"S4BM130,170C0U90R100D
90L100BE9U72R70D72L70":PAINT(142
,91),0,0:CIRCLE(220,100),7:FOR X
=120 TO 150 STEP10:CIRCLE(220,X)
,4:NEXT:CIRCLE(178,80),11,0,1,.5
,1:DRAW"BM178,70NH30E30BM220,100
U7D14":CIRCLE(148,40),2
390 CIRCLE(208,40),2:PAINT(178,7
7),0,0:DRAW"BM10,9S8"+T$+V$+SP$+
S$+H$+O$+W$+S$:DRAW"BM10,11R50
400 DRAW"S4":LINE(17,39)-(90,31)
,PSET,B:PAINT(18,36),0,0:DRAW"BM
16,37C1"+T$+U$+R$+N$+SP$+O$+N$+S
P$+T$+V$:DRAW"C0":LINE(17,54)-(9
0,46),PSET,B:PAINT(18,51),0,0:DR
AW"BM16,52C1"+T$+U$+R$+N$+SP$+O$
+F$+F$+SP$+T$+V$
410 DRAW"S4BM15,68C0"+N$+E$+T$+W
$+O$+R$+K$+SP$+N$+E$+W$+S$:DRAW"
BM15,83"+C$+A$+R$+SP$+C$+A$+R$+E
$+SP$+S$+H$+O$+W$:DRAW"BM15,98"+
W$+E$+S$+T$+E$+R$+N$+SP$+M$+O$+V
$+I$+E$:DRAW"BM15,113"+T$+H$+E$+
SP$+L$+O$+V$+E$+SP$+B$+O$+A$+T$
420 DRAW"BM15,128"+M$+U$+S$+I$+C
$+SP$+T$+E$+L$+E$+V$+I$+S$+I$+O$
+N$:DRAW"BM15,143"+C$+O$+P$+S$+S
P$+A$+N$+D$+SP$+R$+O$+B$+B$+E$+R
```

```
$+S$:DRAW"BM15,158"+T$+H$+R$+E$+
E$+SP$+S$+T$+O$+O$+G$+E$+S$
430 H=0:V=96:ZZ=0
440 BB$="R10NH3G3
450 DRAW"C0BM=H;,=V;"+BB$
460 II$=INKEY$
470 IF II$=CHR$(94)THEN DRAW"C1B
M=H;,=V;"+BB$:SOUND 210,1:V=V-15
480 IF II$=CHR$(10)THEN DRAW"C1B
M=H;,=V;"+BB$:SOUND 210,1:V=V+15
490 IF II$=CHR$(13)AND V=36 AND
ZZ=0 THEN 820
500 IF II$=CHR$(13)AND V=51 AND
ZZ=1 THEN 810
510 IF II$=CHR$(13)AND V=66 AND
ZZ=1 THEN 610
520 IF II$=CHR$(13)AND V=81 AND
ZZ=1 THEN 660
530 IF II$=CHR$(13)AND V=96 AND
ZZ=1 THEN 680
540 IF II$=CHR$(13)AND V=111 AND
 ZZ=1 THEN 700
550 IF II$=CHR$(13)AND V=126 AND
 ZZ=1 THEN 710
560 IF II$=CHR$(13)AND V=141 AND
 ZZ=1 THEN 730
570 IF II$=CHR$(13)AND V=156 AND
 ZZ=1 THEN 750
580 IF V>156 THEN V=156
590 IF V<36 THEN V=36
600 GOTO 450
610 GOSUB 830:DRAW"C0":CIRCLE(17
6,120),19:CIRCLE(176,124),3
620 CIRCLE(169,117),4,0,.9:CIRCL
E(183,117),4,0,.9:DRAW"BM171,126
R10DL10DR10DL10BM165,114R7UL7BR1
5R7DL7BM170,129F3R6E3BM176,102D3
FDFDRDRDR8F2DFD6FRBM176,104DGDGD
LDLDL8G2DGD6GLBM166,135GDGDGLGL9
GLGLGDGDGDGDGDG3BM187,135FDFDFRF
R9FRFRFDFDFDFBM165,135
630 DRAW"M176,160M189,135D12L5F4
M176,161LBM164,137D10R4G4M176,16
0":CIRCLE(177,142),4:PAINT(177,1
42),0,0:DRAW"BM177,139DF2DF2DF2B
M177,139DG2DG2DG2BM175,142D14RU1
4RD15RU14":PAINT(177,103),0,0:PA
INT(175,103),0,0:PSET(169,117):P
SET(183,117)
640 DRAW"BM149,96"+B$+U$+L$+L$+E
$+T$+I$+N$:FOR X=1 TO 2000:NEXT:
GOSUB830:DRAW"BM142,96"+N$+E$+W$
+S$+SP$+F$+L$+A$+S$+H$:DRAW"BM15
0,124"+R$+A$+I$+N$+B$+O$+W$:DRAW
"BM150,132"+M$+A$+G$+A$+Z$+I$+N$
+E$:DRAW"BM141,140"+N$+A$+M$+E$+
```

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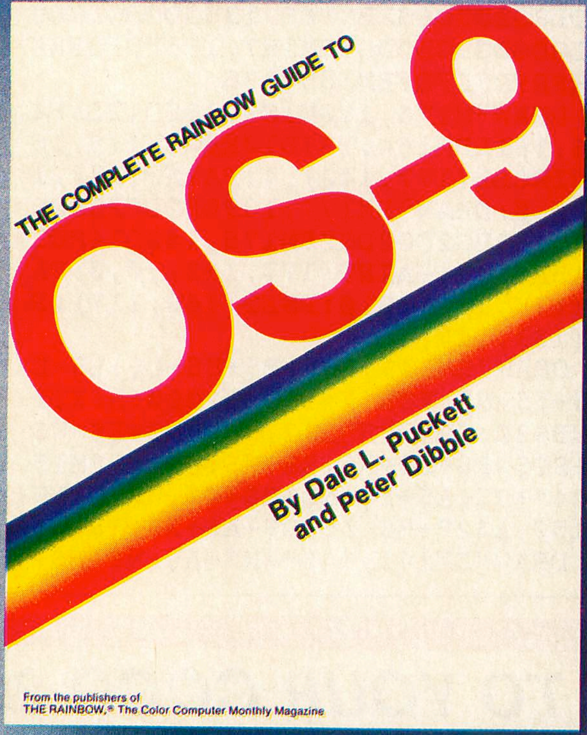
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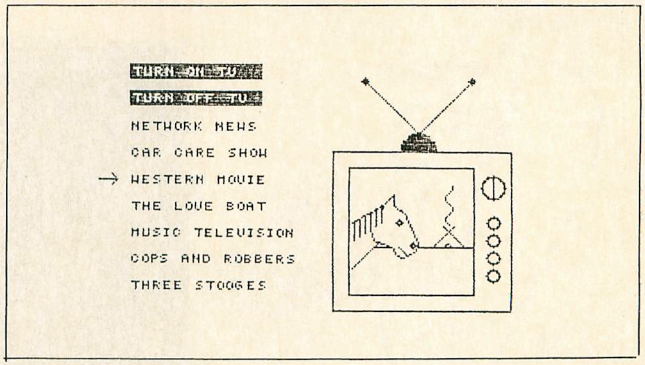
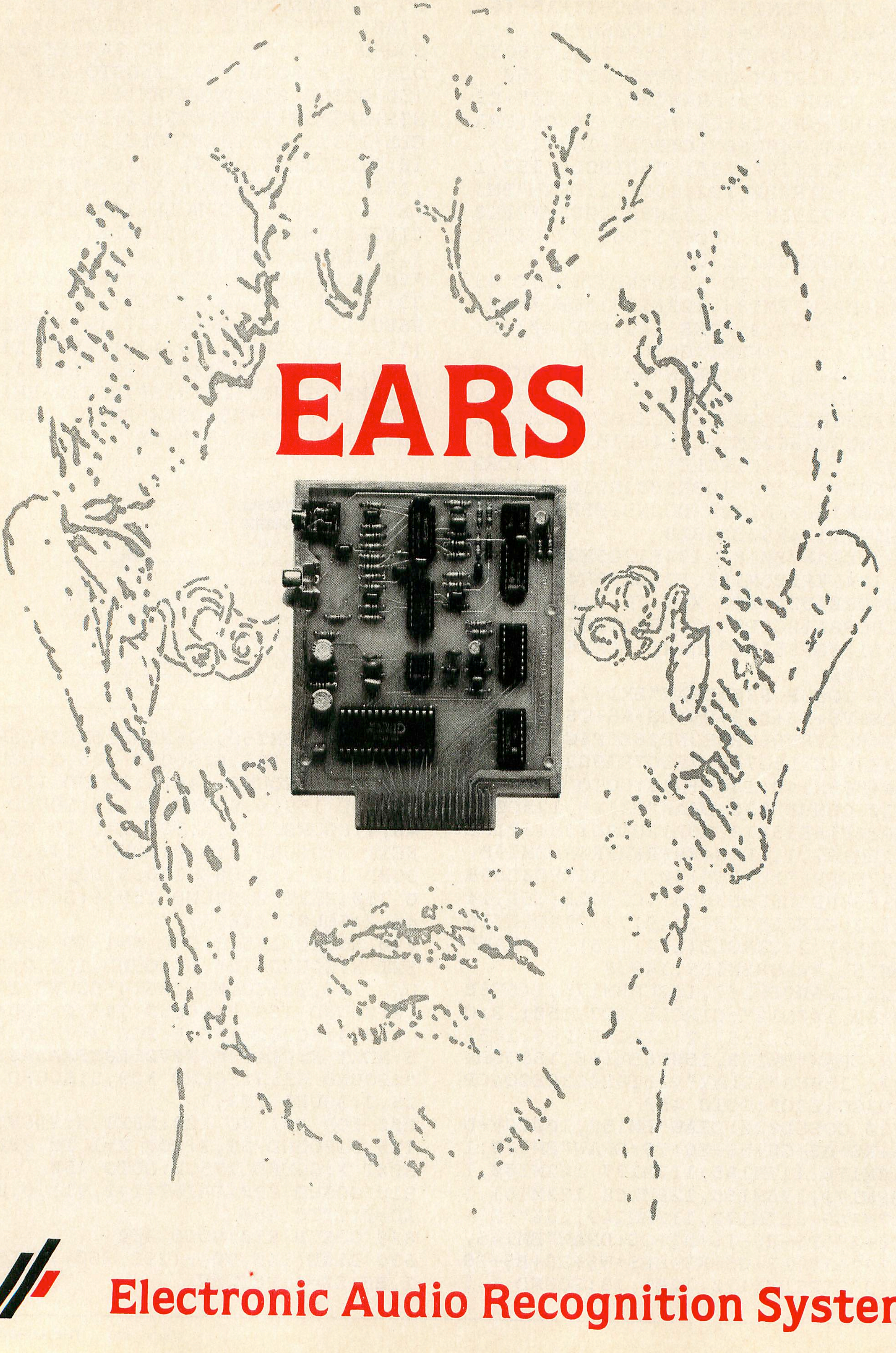
```
D$+SP$+N$+O$+PD$+SP$+N1$
650 DRAW"BM155,148"+A$+G$+A$+I$+
N$+PD$:FOR X=1 TO 3:QZ$="1;2;3;4
;5;6;7;8;9;10;11;12;":PLAY"T9O5L
24V15;":PLAY QZ$:NEXT:GOTO 450
660 GOSUB 830:DRAW"BM143,100"+C$
+A$+R$+SP$+C$+L$+I$+N$+I$+C$:DRA
W"BM141,140R68":CIRCLE(157,135),
5:CIRCLE(192,135),5:CIRCLE(157,1
35),1:CIRCLE(192,135),1:DRAW"BM1
62,136R25BM147,136NR3U20R30F7R18
D12L3BM150,118ND6R17D6L17R9U6BR1
1ND6R5F6ND12L11D12
670 FOR X=1 TO 1500:NEXT:EXEC 43
345:DRAW"BM184,123E13":FOR K=20
TO 45 STEP.2:POKE 140,RND(40)+K:
EXEC 43345:NEXT:GOTO 450
680 GOSUB 830:DRAW"BM141,120M158
,110ND2M164,104D6M171,116D2M178,
132D2GDGLGLGNH5LGL2HLHUHUHLHLHL2
HL2HUHU2HU2BM141,146E15":CIRCLE(
167,120),2:CIRCLE(175,133),2:DRA
W"BM142,120ND10BR3BU2ND10BR3BU2N
D10BR3BU2ND10BR3BU2ND10BR3BU2D10
BM179,134R30BL48L8
690 DRAW"BM186,134E12G3H3F12BM19
3,134UERFDBM186,134BE9BU4H2U2E4U
2H4U2E4U2":FOR X=1 TO 2:PLAY"O4T
4L9CP8L12CCP8L12CCP8L12CGP8L12EG
P8L12EGP8L12E":NEXT:PLAY"L3C":GO
TO 450
700 GOSUB 830:DRAW"BM147,100"+L$
+O$+V$+E$+SP$+B$+O$+A$+T$:DRAW"B
M148,128NR48R8E3NR26E6R4G2R22G3N
D3E3L4E7L5G7L5E7L5G7R19G3D3R12D7
L44H5BM140,134"+WA$:GOTO 450
710 GOSUB 830:DRAW"BM145,125C0U3
0R10F15E15R10D30L12U18G13H13D18L
12BM187,116E8G4FRFRFRFRFRFBM198,
107FRFRFRFU10BM140,140R68BD3L68B
D3R68BD3L68BD3R68":CIRCLE(150,14
2),2:CIRCLE(158,149),2:CIRCLE(16
6,152),2:CIRCLE(174,146),2:DRAW"
BM151,142U8BM159,149U8
720 DRAW"BM167,152U8BM175,146U8B
M180,140D12":CIRCLE(187,150),2:C
IRCLE(195,155),2:CIRCLE(203,145)
,2:DRAW"BM188,150U8BM196,155U8BM
204,155U8":PLAY"V15T8L4O3CEGO4CP
4O3GO4L3C":GOTO 450
730 GOSUB830:DRAW"BM150,100C0"+D
$+R$+A$+G$+N$+E$+T$:DRAW"BM172,1
10M176,117M185,117M177,122M180,1
29M172,126M165,129M168,122M161,1
17M169,117M172,110BM149,150"+S$+
T$+A$+R$+R$+I$+N$+G$:DRAW"BM145,
157"+J$+A$+C$+K$+SP$+W$+E$+B$+B$
740 CIRCLE(172,120),13:SOUND 1,1
2:SOUND 34,4:SOUND 44,2:FOR X=1
TO 340:NEXT:SOUND 1,9:FOR X=1 TO
 700:NEXT:SOUND 1,12:SOUND 34,4:
SOUND 44,2:FOR X=1 TO 340:NEXT:S
OUND 1,9:SOUND 79,12:GOTO 450
750 GOSUB 830:DRAW"BM145,100C0"+
N3$+SP$+S$+T$+O$+O$+G$+E$+S$:CIR
CLE(153,130),10:CIRCLE(175,130),
10:CIRCLE(197,130),10:DRAW"BM145
,128R16":PAINT(146,126),0,0:CIRC
LE(167,128),2:CIRCLE(168,125),2:
CIRCLE(169,122),2:CIRCLE(183,128
),2:CIRCLE(182,125),2
760 CIRCLE(181,122),2:PSET(153,1
33):PSET(175,133):PSET(197,133):
PSET(149,129):PSET(157,129):PSET
(171,129):PSET(179,129):PSET(193
,129):PSET(201,129):DRAW"BM140,1
42E6BR13F3ND21E3BR16F4ND21E4BR15
F3BM147,155"+M$:DRAW"BM172,155"+
L$:DRAW"BM195,155"+C$
```



```
770 DRAW"BM150,136R6BR16R6BR16R6
780 SOUND 125,6:SOUND 133,2:SOUN
D 146,12:SOUND 146,4:SOUND 170,8
:SOUND 159,6:SOUND 146,2:SOUND 1
46,4:SOUND 175,5:FOR X=1 TO 350:
NEXT X:SOUND 159,6:SOUND 146,2:S
OUND 146,4:SOUND 170,5:FOR X=1 T
O 350:NEXT X:SOUND 159,6:SOUND 1
46,2:SOUND 146,4
790 SOUND 175,5:FOR X=1 TO 350:N
EXT X:SOUND 125,6:SOUND 133,2:SO
UND 146,12:SOUND 146,4:SOUND 170
,8:SOUND 159,6:SOUND 146,2:SOUND
 146,4:SOUND 175,5:FOR X=1 TO 52
5:NEXT X:PLAY"O3T2V25L8EFAAAAGFD
":SOUND 89,3:SOUND 109,3:SOUND 1
25,3:SOUND 109,3
800 FOR X=1 TO 120:NEXT X:SOUND
125,3:SOUND 89,3:FOR X=1 TO 200:
NEXT X:SOUND 175,2:GOTO 450
810 GOSUB 830:PAINT(142,91),0,0:
ZZ=0:GOTO 450
820 GOSUB 830:GOTO 450
830 LINE(140,90)-(208,160),PRESE
T,BF:ZZ=1:RETURN
```

EARS



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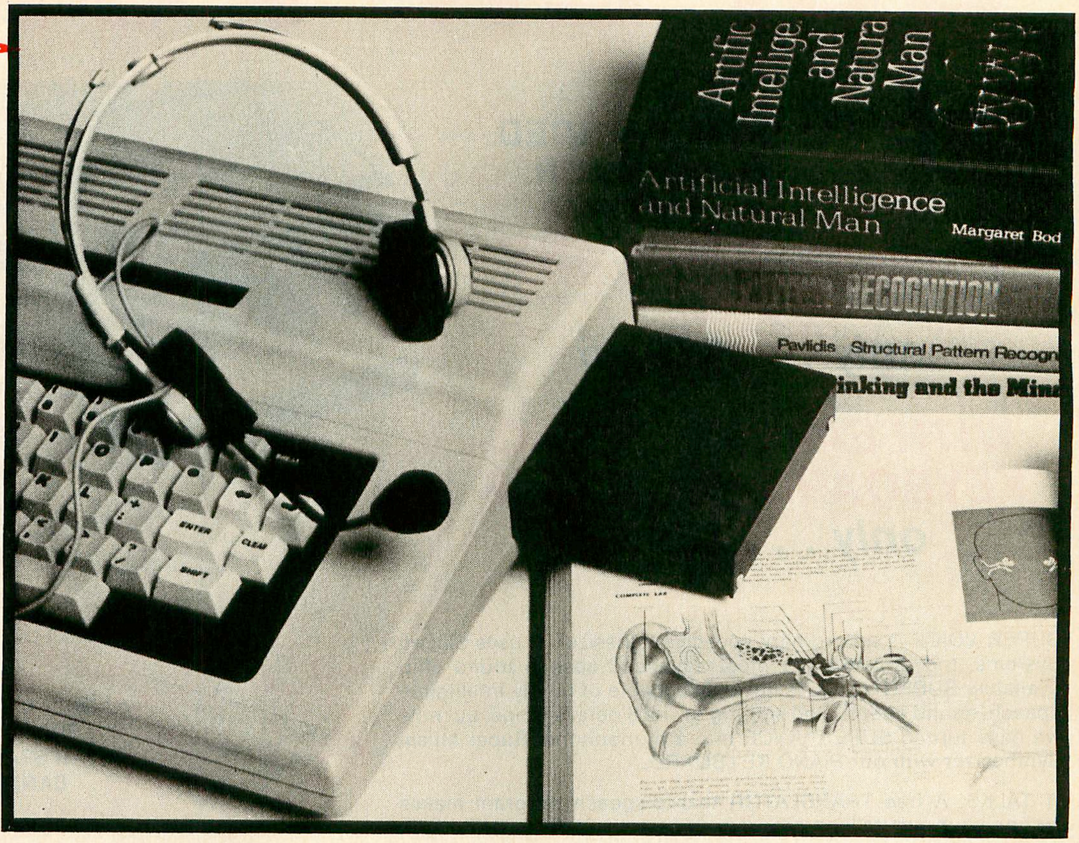
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Margaret Bod
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- HIGH QUALITY SPEECH REPRODUCTION

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Speech and Sound Recognition. EARS is really a sound recognition system, so it really doesn't matter whether you speak in English, Spanish, or French. In fact you do not have to speak at all, you can train EARS to understand sounds such as a musical note or a door slamming.

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You Get Everything You Need. You get everything you need including a specially designed professional headset style noise cancelling microphone. The manual is easy to use and understand. Several demonstration examples are included so you don't have to write your own programs unless you want to. EARS will work in any 32K or 64K Color Computer.

SUPER VOICE $20 OFF

Imagine talking to your computer and it talking back to you. When you need an unlimited vocabulary, you can't beat SUPER VOICE. For a limited time, we will give you the SUPER VOICE for $59.95 with your EARS purchase. Even if you already have another speech unit, here is your chance to buy the best and save $20.

VOICE CONTROL

Applications for EARS are astounding. Here is our first of many listening programs to come. VOICE CONTROL is a program specifically designed to allow you to control any appliance in your house with your voice and our HOME COMMANDER (sold separately). For example, you can control your TV by saying "TV ON" or TV OFF". $24.95

FREE BLANK DISK OR TAPE WITH EVERY ORDER

VISA® MasterCard

Dealer Inquiries Invited

We accept CASH, CHECK, COD, VISA and MASTER CARD orders.

Shipping and handling US and Canada	$3.00
Shipping and handling outside the US and Canada	$5.00
COD charge	$2.00

Illinois residents add 6¼% sales tax

Speech Systems

38W 255 DEERPATH ROAD
BATAVIA, ILLINOIS 60510
(312) 879-6880 (VOICE)
1 MEGABYTE COLORAMA **(312) 879-6811 (24 HR. BBS)**

CALL ANY DAY TO ORDER. ALSO ORDER BY MAIL OF BBS.

'SUPER VOICE' T.M.

musical applications of microprocessors

COCO'S MOST ADVANCED SPEECH SYNTHESIZER.

IT TALKS, SINGS AND MORE.

only . . . $79.95

WITH EARS OR PIANO KEYBOARD PURCHASE

only . . . $59.95

SUPER VOICE is no ordinary speech synthesizer. It uses Silicon Systems, Inc. SSI-263, the most advanced speech/sound chip available. SUPER VOICE is not only capable of highly intelligible speech, sound effects, and singing over a 6 octave range, but now we have turned SUPER VOICE into a monophonic Super Music Synthesizer with our PIANO KEYBOARD.

IT TALKS. A free TRANSLATOR text-to-speech program makes writing your own talking program as easy as SAYING "HELLO."

SUPER VOICE works in any 32K or 64K computer. A disk system requires a Y-Cable or Multi-Pak.

Here are the facts; the decision is yours.

	SUPER VOICE	REAL TALKER	RS SPEECH CARTRIDGE	VOICE-PAK
Synthesizer Device	SSI-263	SC-01	SP-256	SC-01
Speaking Speeds	16	1	1	1
Volume Levels	16	1	1	1
Articulation Rates	8	1	1	1
Vocal Tract Filter Settings	255	1	1	1
Basic unit of Speech	64 phonemes 4 durations each	64 phonemes	64 allophones 5 pause lengths	64 phonemes
Pitch Variations	4096 (32 absolute levels with 8 inflection speeds)	4	1	4

FREE "REACTION" To Test Your Reflexes

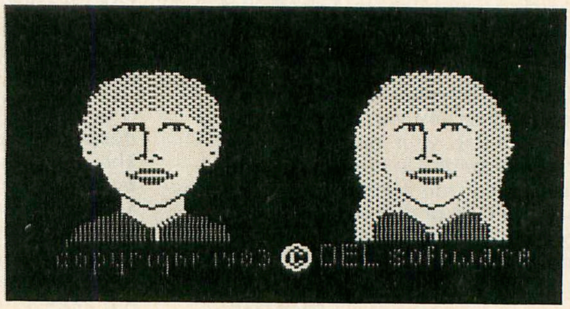
FREE SUPER VOICE SINGS THE STAR SPANGLED BANNER

FREE "SIMON" To Test Your Memory

FOOL'S CROSSING

The world's first TALKING HI-RES GRAPHICS adventure. Finding the hidden treasure is the easy part, getting back home is another story.

32K Disk	$24.95



SUPER TALKING HEADS

When the SUPER VOICE speaks in a low pitched voice, the man speaks, when a high pitched voice is used the woman speaks. $24.95

FREE BLANK DISK OR TAPE WITH EVERY ORDER

VISA MasterCard

Dealer Inquiries Invited

We accept CASH, CHECK, COD, VISA and MASTER CARD orders.

Shipping and handling US and Canada	$3.00
Shipping and handling outside the US and Canada	$5.00
COD charge	$2.00

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'TALKING SOFTWARE'

FOR THE VOICE, SUPER VOICE™, RS SPEECH & SOUND PAK

RADIO SHACK®
SPEECH & SOUND TRANSLATOR

FREE When you buy any 5 of our Talking Programs

We believe that no COCO speech synthesizer gives you the power and flexibility of the SUPER VOICE. Nevertheless, some have decided to go with the Radio Shack SPEECH & SOUND PAK. For those we've decided to open our TALKING LIBRARY by offering the SPEECH & SOUND TRANSLATOR . Just load this program and our entire library is open to you.

But that's not all, this program adds features. You get increased intelligibility, the power of an exception table to specify specific pronunciations, $12.81 is spoken in dollars and cents, 1,234,567 is spoken in millions, thousands, and hundreds, and much more. **$24.95**

TERMTALK All the features of an intelligent telecommunications program plus what appears on the TV is spoken.

- Upload and Download programs
- Full or Split Screen
- Normal or Reverse Video
- Control Xmit Protocols
- Buffer Editing
- It talks

Please specify version (VOICE or RS SPEECH & SOUND PAK)
Tape **$39.95** Disk **$49.95**

TALKING BINGO BINGO was never like this. The VOICE or SUPER VOICE makes all the calls while you sit back and play. Comes with 20 playing cards and 200 markers. High Resolution graphic screen, 3 timing level, ball count and pause control. **$24.95**

ESTHER the talking psychoanalyst. An excellent example of artificial intelligence. She may not solve all your problems, but her insight will amaze you. Just like the original Eliza. **$24.95**

SCORE E-Z A yahtzee type game. Up to six can play. **$24.95**

ADVENTURES

CULT OF THE CAVE BEAR You're a stranded time traveler 50,000 years in the past. Can you fix your time machine while still surviving in this alien environ, and make it back? **$29.95**

SHIP HUNT Play Battleship with your CoCo. All status reports are spoken. Ready battery, aim, fire at will! **$24.95**

FINAL COUNTDOWN You must stop the mad general from launching a missile at Moscow and causing WW III. Has multiple voices for added realism. **$24.95**

STAR TALK You're the Star Fleet Captain. Your mission...destroy the enemies' Dragon Star Ships. All status reports are spoken! **$24.95**

FOOL'S CROSSING The world's first TALKING HI-RES GRAPHICS adventure. Finding the hidden treasure is the easy part, getting back home is another story. **$24.95**

ADVENTURE GENERATOR Create talking adventure games that are 100% Machine Language. Up to 99 rooms, 255 objects, 70 command words and 255 conditional flags. 64K Disk **$39.95**

SUPER VOICE SONGBOOKS

These two songbooks were specifically designed for the SUPER VOICE, the only speech synthesizer flexible enough to allow singing.

VOLUME I (POTPOURRI) A collection of miscellaneous tunes for everyone. Songs include: How Much Is That Doggie in the Window, Daisy, Aloha Oe, Old McDonald and more. **$19.95**

VOLUME 2 (NURSERY RHYMES) Includes: Twinkle Twinkle Little Star, Mary Had A Little Lamb, 3 Blind Mice, the Alphabet Song and more. May be used with SUPER TALKING HEADS so they (Paul & Pauline) sing the songs. **$19.95**

EDUCATION

ANIMATED SENTENCES The child builds complete sentences from a graphic menu using keyboard or joystick. The action is then spoken and acted out graphically. It's a great way to learn the parts of speech (i.e. verb, subject, noun, etc.). **$24.95**

KING AUTHOR'S TALES A creative writing tool to allow a child to write compositions, or short stories. Q & A option is also included. **$29.95**

COLOR MATH Addition, Subtraction, Multiplication, and Division are mastered. Student may specify difficulty level. **$24.95**

SPELL-A-TRON Student builds a dictionary of words to be quizzed on. Perfect for Spelling B. **$24.95**

SPELLING TESTER A graphic spelling game. The student is shown objects to be spelled. **$9.95**

POETRY CREATOR The VOICE speech unit is used to speak poetry that is created. **$9.95**

SHORT STORY MAKER A program to create and speak stories created by the child. **$9.95**

FOREIGN LANGUAGE Learn a foreign language. French dictionary is included. **$9.95**

PRESIDENTS The student is able to master the Presidents of the U.S. **$9.95**

STATES A program designed to aid the student in learning correct spelling of the states. **$9.95**

CAPITALS Learning the State's Capitals is made more interesting using speech. **$9.95**

HANGMAN A word guessing game. You must guess the word before you hang. **$9.95**

MATH DRILL A program to help teach arithmetic. **$9.95**

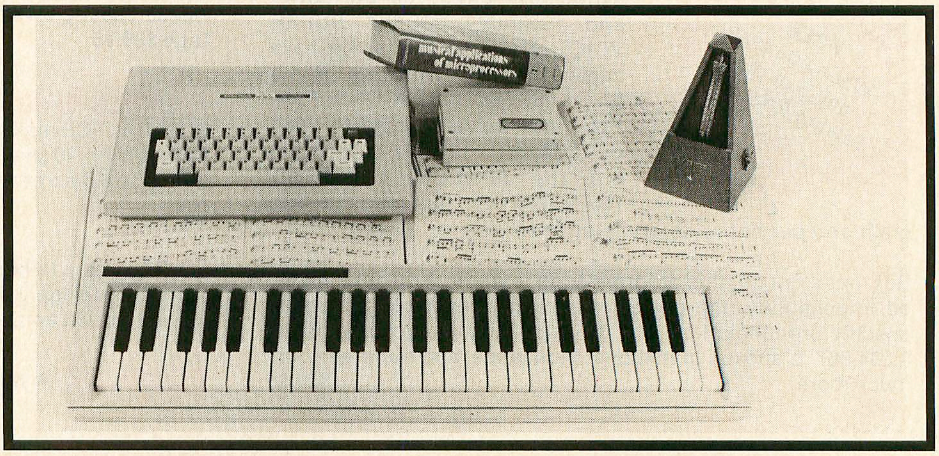
All software, except as noted, shipped on tape but may be moved to disk.

SYMPHONY 12™

A 12 VOICE POLYPHONIC STEREO MUSIC SYNTHESIZER

$79.95 $69.95 WHEN PURCHASED WITH MUSICA 2 $59.95 WHEN PURCHASED WITH THE PIANO KEYBOARD

- 12 SIMULTANEOUS VOICES
- STEREO & MONO
- 4 NOISE GENERATORS
- SOUND EFFECTS
- PLAYS AND CREATES MUSICA 2 FILES



SUPER POLYPHONIC. Speech Systems is proud to bring you SYMPHONY 12, a polyphonic 12 voice hardware stereo music synthesizer for the Color Computer. SYMPHONY 12 also gives you 4 noise generators for percussion synthesis and sound effects. The PIANO KEYBOARD and MUSICA 2 (sold separately) turns your COCO into a real music machine with incredible flexibility.

STEREO and MONO. By connecting SYMPHONY 12 to your home stereo system, music is produced in stereo, 6 voices from each channel. However, you don't need to have a stereo system, all 12 voices also come out of your TV or monitor.

PICK AN INSTRUMENT. SYMPHONY 12 lets you choose from 10 preset instruments to synthesize chimes, violin, oboe, banjo, harpsichord, piano and more. You can even change instruments as the music plays.

SOUND EFFECTS. SYMPHONY 12 is a sophisticated sound generator. 12 voices and 4 noise generators give you incredible sound effect capability. We have included gun shot, explosion, racing car and more.

WATCH IT PLAY. As SYMPHONY 12 plays, a graphics display of a piano keyboard shows the notes playing. The display is entertaining as well as very educational.

PLAY MUSICA 2 FILES. Thousands of MUSICA 2 users will be excited to know SYMPHONY 12 plays all music developed using MUSICA 2 like you have never Seen or Heard it. In fact we highly recommend the use of MUSICA 2 as a composition development tool for SYMPHONY 12. Use MUSICA 2's superior graphics input capability and then play it through SYMPHONY 12. You can also take advantage of our MUSIC LIBRARY series (sold separately) to give you access to over 500 music pieces representing 20 hours of music.

ULTIMATE MUSIC DEVELOPMENT SYSTEM. SYMPHONY 12, MUSICA 2, and the PIANO KEYBOARD give you incredible flexibility. Imagine sitting down at the PIANO KEYBOARD, playing a piece and recording it as you play just as you would to a tape recorder. Save your masterpiece and then using MUSICA 2 edit it if you like and print it. If you have a MIDI synthesizer, you can take the music and play it using COCO MIDI (sold separately). Try that on an IBM, APPLE, or COMMODORE (good luck).

PIANO KEYBOARD. For those wishing to turn SYMPHONY 12 into a real polyphonic synthesizer we offer the extremely powerful and versatile PIANO KEYBOARD. The PIANO KEYBOARD was deisgned to be used in our entire music product line. You can use it with SYMPHONEY 12, MUSICA 2, SYNTHER 77 PLUS, and even our advanced speech synthesizer, SUPER VOICE.

When using MUSICA 2, you will be using 4 of the 12 voices available from SYMPHONY 12. To take advantage of the full 12 voice capability of SYMPHONY 12 you may use either the Color Computer's keyboard or the PIANO KEYBOARD.

Y-CABLE or MULTI-PAK. Tape users using both SYMPHONY 12 and the PIANO KEYBOARD will require a Y-CABLE. Disk users will require the Triple Y-Cable or MULTI-PAK.

SYMPHONY 12. You get over a dozen music and sound effect selections and complete documentation. Software is shipped on Tape or Disk.

OPTIONS

MUSIC LIBRARY (each volume)	$29.95
MUSICA 2	$29.95
PIANO KEYBOARD 2½ octave	$79.95
PIANO KEYBOARD 4 octave	$119.95

FREE BLANK DISK OR TAPE WITH EVERY ORDER

VISA® MasterCard

Dealer Inquiries Invited

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Shipping and handling US and Canada	$3.00
Shipping and handling outside the US and Canada	$5.00
COD charge	$2.00

Illinois residents add 6¼% sales tax

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(312) 879-6880 (VOICE)
1 MEGABYTE COLORAMA (312) 879-6811 (24 HR. BBS)

CALL ANY DAY TO ORDER. ALSO ORDER BY MAIL OR BBS.

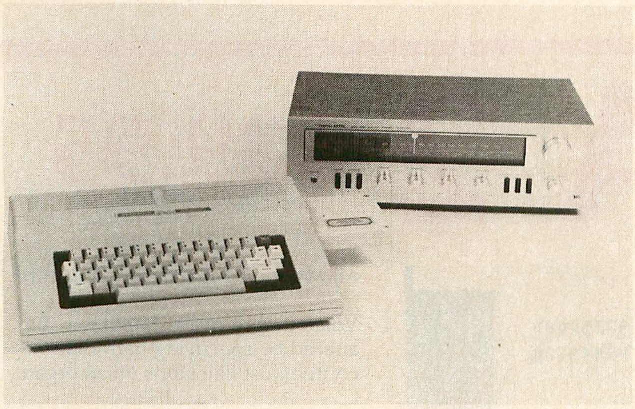
AWESOME

STEREO PAK™

$39.95

Plug this gem into your computer, connect to your home stereo system and sit back and enjoy music realism. The STEREO PAK is a hardware music synthesizer that plays our MUSIC LIBRARY series and MUSICA 2 music in stereo. Because it was designed specifically with music reproduction in mind, the sound is superb. The highs are crisp and clear while the bass notes will rattle your walls. Internally we use two high performance 8 bit digital to analog converters to assure fidelity.

The STEREO PAK is all hardware. It is intended as an enhancement for MUSICA 2 and our MUSIC LIBRARY series. Disk users will require our Y-CABLE or a MULTI-PAK.



NEW

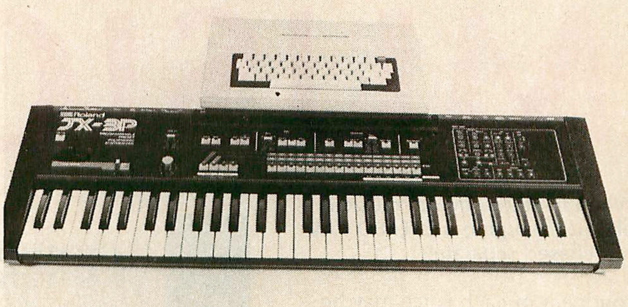
COCO MIDI™

$39.95
Tape or Disk

Now your COCO can talk to your MIDI music synthesizer. Whether you have a Korg, Roland, Casio, or Yamaha, it doesn't matter as long as it's MIDI equipped.

COCO MIDI takes any MUSICA 2 music file and plays it through your music synthesizer. We offer you over 500 tunes from our MUSIC LIBRARY series (sold separately) or create your own music using the best music composition program available, MUSICA 2 (sold separately).

COCO MIDI includes: documentation, plenty of music, and the cable to connect between the COCO and your synthesizer.



20 HOURS OF MUSIC

MUSIC LIBRARY™

$29.95
Tape or Disk

The MUSIC LIBRARY series consists of 5 volumes: 100, 200, 300, 400, and 500 each sold separately. Each contains over 100 four voice music selections with a playing time of over 3 hours each. The disk version is shipped on 5 full disks. When coupled with the STEREO PAK, the music is reproduced with unsurpassed realism.

A JUKEBOX program is included to allow you to select specific songs or automatically play each. These songs are ready to go, you don't need MUSICA 2 or a knowledge of music. MUSICA 2 users may customize each song. Requires minimum of 32K.

MUSIC LIBRARY 100

- Stage, Screen, & TV
- Music of the 70's
- Music of the 60's
- Music of the 50's
- Old Time Favorites
- Classical
- Christmas (popular)
- Christmas (traditional)
- Patriotic
- Polka Party

MUSIC LIBRARY 200 (another 100 selections)
MUSIC LIBRARY 300 (another 100 selections)
MUSIC LIBRARY 400 (another 100 selections)
MUSIC LIBRARY 500 (another 100 selections)

Each volume sold separately, specify tape or disk.

Write for complete list.

SAVE $50!

ALL 500 $99.95

NEW

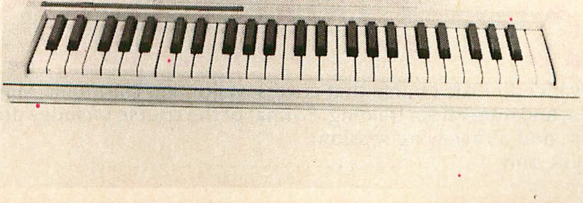
SYNTHER 77 PLUS

$29.95
Disk

We put the PLUS in SYNTHER 77 PLUS by connecting our PIANO KEYBOARD so you can really play your COCO like a piano.

You control vibrato pattern, Bender rate, Volume level as well as Attack, Decay, Sustain, and Release (ADSR envelope). As you play you can record, then edit and save it to disk or tape. You can even fine tune it to match other instruments.

The PIANO KEYBOARD is not necessary, you can use your COCO keyboard but the PIANO KEYBOARD makes your COCO a real music instrument.



FOR
MUSICA 2
SUPER VOICE
SYMPHONY 12
SYNTHER 77

♫ PIANO KEYBOARD ♫

Now you can really play your Color Computer and pick any or all 4 instruments: **MUSICA 2, SYNTHER 77 PLUS, SUPER VOICE,** and the ultimate **SYMPHONY 12.**

MUSICA 2 users can use the PIANO KEYBOARD as an easy method to input music. Version 2.7 is required. Previous users may obtain an update by returning original tape or disk with $7.00.

SYNTHER 77 PLUS turns your COCO into a music synthesizer without any additional hardware. You specify Vibrato, Bender, Volume, as well as Attack, Decay, Sustain, and Release (ADSR).

SUPER VOICE, COCO's most advanced speech synthesizer becomes a music synthesizer when connected to the PIANO KEYBOARD.

SYMPHONY 12 and the PIANO KEYBOARD gives you a professional 12 voice music synthesizer.

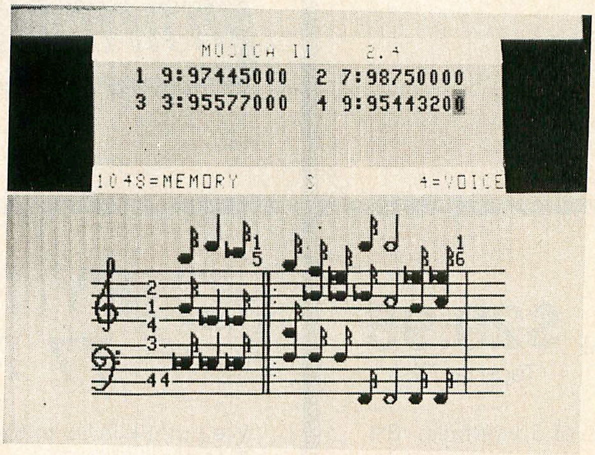
These Piano Keyboards are not toys. They are the same style, shape, size, and feel as professional synthesizer keyboards. Disk owners must use a Y-CABLE or MULTI-PACK.

2½ octave (32 note) . . . . **$79.95** **4 octave** (49 note) **$119.95**

MUSICA 2 $29.95

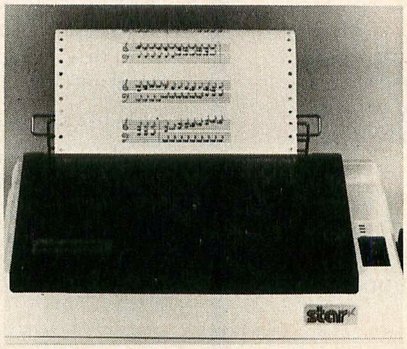
Tape or Disk

- When in stereo mode, music is played through our STEREO PAK (purchased separately).
- Loudness of each voice may be individually specified.
- Memory available is constantly displayed.
- Voice waveshapes may be exchanged between voices at any point.
- Tempo may be specified and may even be altered as the music plays.
- Flats and sharps supported.
- Billions of timbre combinations.
- High resolution graphic display, looks just like sheet music.
- MUSICA 2 is 100% software, no need for hardware unless you want music produced in STEREO. In that case, the STEREO PAK may be purchased separately. It's a must for the audiophile!
- Repeat bars allow repeating of music without re-inserting music a second or third time.
- 30 page manual describes all.
- Requires minimum of **64K**



```
          MUSICA II     2.4
  1 9:97445000   2 7:98750000
  3 3:95577000   4 9:95443200
1048=MEMORY         S         4=VOICE
```

- Output music to your printer (Gemini 10X, Epson, R.S. printers).



- Allows you to specify key signature.
- Voice timbre (waveshape) may be altered by specifying harmonic content just like stops on an organ.
- During editing, voice being inserted is displayed.
- Each measure is numbered for easy reading of music.
- Measure bars aid in reading and developing music.
- Each voice may be visually highlighted for easy identification.
- 4 Voices produced simultaneously.
- Input notes from Coco keyboard, joystick, or Piano Keyboard.
- Play music from your own BASIC program.
- Block copy music for easy music development.
- 100% machine language so it is lightning fast.
- Vibrato effect easily produced.
- With STEREO PAK, voices may be switched between left and right speakers as music plays.
- Durations include: whole, half, quarter, eighth, sixteenth, thirty-second, sixty-fourth, and triplet.

♫ ♫ MUSIC THEORY ♫ ♫

An advanced music course that covers Major and Harmonic Minor scales, interval spelling, Triad (Chord) theory, Inversions, Dominant 7th chords, and interval ear training. Format of the course includes drill and practice sessions, a scorecard to measure progress, graphics and sound output, and a reviewing session.

32K Disk only **$49.95**

'HOME COMMANDER'

$59.95

VOICE CONTROL
APPLIANCES
WITH EARS

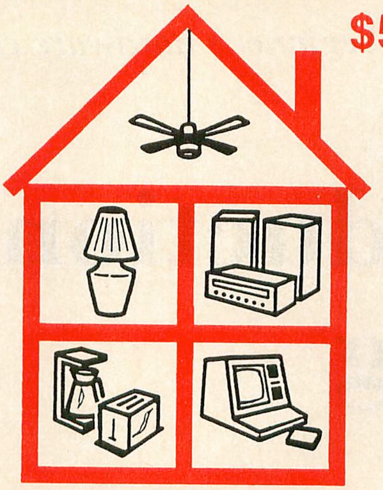
The HOME COMMANDER easily connects to the cassette port of your Color Computer and lets you control appliances in your home.

NO WIRES NECESSARY

The HOME COMMANDER uses your home's existing electrical wiring to control virtually anything. Appliances are controlled via small control modules available at your local SEARS or Radio Shack store.

ON FRIDAY 7:42 PM, OFF
SUNDAY 1:26 AM

Included FREE is a program to allow you to control up to 256 devices and specify the time and date they are to be activated. That's right, the software has its own built in accurate clock.



Imagine controlling a light or TV with your voice. When used with our Electronic Audio Recognition System, EARS, you can literally control any appliance.

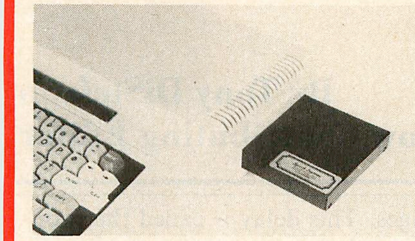
PLUG'N POWER USERS

If you were disappointed in the software that came with the Radio Shack PLUG'N POWER unit, and you probably were, we'll offer you our powerful software separately. An early version is described in the Feb., April, June, and August 1983 issues of RAINBOW. Our current version is even better. **$19.95**

PLUG'N POWER is a trademark of Radio Shack®

PRECISION TIME MODULE $59.95

— INCLUDES OS9 DRIVER —



Now your computer will always know the correct time and date. This amazing precision time module is calibrated to the National Bureau of Standards (WWV) atomic clock and you should never have to change it.

Use the PRECISION TIME MODULE to add the time element to your games or use on BBS. If you like, purchase separately our BBS.

COLORAMA BBS (64 K, 1 drive minimum) **$99.95**

BATTERY BACKUP

Even when your computer is off, the clock keeps correct time by operating using the internal battery backup system.

THE
TIMEPIECE
FOR THE
COLORAMA
BBS

FREE
TALKING CLOCK
PROGRAM
requires VOICE,
SUPER VOICE,
or
SPEECH & SOUND PAK

MONTHS, LEAP YEARS & DST

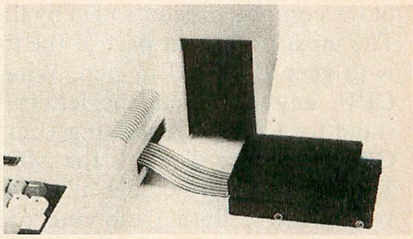
The PRECISON TIME MODULE automatically adjusts for the different number of days in each month as well as leap years. And believe it or not, it adjusts for DST so you don't have to remember if it's SPRING FORWARD or FALL FORWARD.

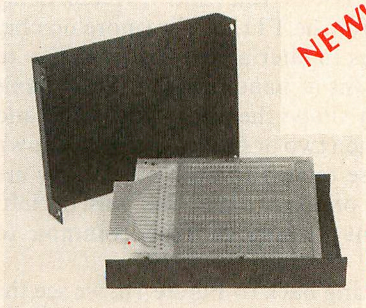
Y-CABLE $28.95

Why pay $100 to $200 for a multi-pak. With the Y-CABLE, you can connect your disk system to your computer along with either our STEREO PAK music synthesizer, our VOICE, SUPER VOICE speech synthesizers, or our PRECISION TIME MODULE. All connectors gold plated.

TRIPLE Y $34.95

We developed the Triple Y-Cable specifically for those interested in both speech synthesis and speech recognition. The Triple Y-Cable lets you connect EARS and SUPER VOICE to your color computer along with your disk system.





NEW! ATTENTION EXPERIMENTERS!

Interested in building your own project? Our oversized board gives plenty of room for construction while the sturdy aluminum case with black satin finish assures protection and a professional appearance.

Prototype Board only **$19.95**
Prototype Enclosure only **$19.95**
Buy both for **$29.95**

Advanced
Speech
Chip
SSI-263
(SC-02)
$34.95

Need an SC-01? **$29.00**

Disks .... (any quantity)	$1.49
Tape C-10, C-20	$0.69
Hard Tape Box	$0.29
6821	$2.95
74LS138	$0.79
7407	$0.79
IC sockets 14, 16, 22 pin	$0.29
IC sockets 24, 28, 40	$0.39

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BLANK DISK
OR TAPE
WITH EVERY
ORDER

VISA® MasterCard

Dealer Inquiries
Invited

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TURN OF THE SCREW

The third installment of the "beginner's hardware course"

An Introduction to Timing

By Tony DiStefano
Rainbow Contributing Editor

Continuing our journey into the CoCo, this month I will look into the heart of this and any computer — timing. All the hardware of the computer is controlled by timing. The most important part of the timing is to keep the CPU in step. What is a CPU, anyway? Well, the letters CPU stand for Central Processing Unit. The CPU inside the CoCo is the MC6809. The CPU, in a way, does all the work. It can move data from one part of memory to another, compare two values and act according to the result, add and subtract values and so forth. In fact, without the CPU, the rest of the hardware that makes up a computer would be worthless. The CPU is a very complex chip. It has data lines, address lines, interrupt lines, status lines and more. The timing that goes with the CPU is also important. OK, let's get into it. It is a prerequisite to understanding how a CPU works.

Up till now, when I talked about zeros and ones and the change from one to the other, it was considered to be instantaneous. There was no mention of how long it took to change from one state to another. In fact, we are dealing with real life, not just theory. Situations in theory rarely work in real life the way you want or expect them to. Welcome to the real world of delays. Ever caught an on-time airline flight? Ha!

> ***"The first fact of the real world is propagational delay."***

The first fact of the real world is propagational delay. Take, for instance, a simple inverter. Figure 1a shows an inverter. When there is a '1' at the input there is a '0' at the output. A '0' input will give a '1' output. But when the input changes from one state to another, there is a short delay before the output changes. This delay is called the propagational delay, which means the amount of time it takes an electrical signal to go through a logic element or wire.

Figure 1b shows a graph of the input and the output of an inverter. The X-axis (from left to right) shows the passing of time. This can be in seconds, hundredths of seconds, thousandths of seconds and even millionths of seconds. When no time base is given, then time factor is not relevant. Typical delay times for the TTL family (more on chip families in later articles) is from five to 30 ns (ns = nanoseconds). The Y-axis usually shows the binary level of '0' and '1'. When two or more signals are shown that are related to each other, they are shown on top of each other with the left-to-right passing of time common to each.

Getting back to Figure 1b, we see the passing of time and the relation of the input to the output. There is no delay shown in this diagram. To show the delays of each signal for a given complex gate would confuse the diagram. Instead, an overall delay is given for the gate. But, in order to get used to the idea of delays, Figure 1c shows the time delays of a typical inverter. Along with

---

Tony DiStefano is well-known as an early specialist in computer hardware projects. He lives in Laval Ouest, Quebec.

Figure 1a

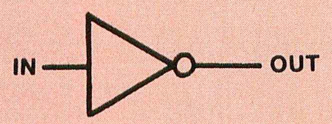


Figure 1b

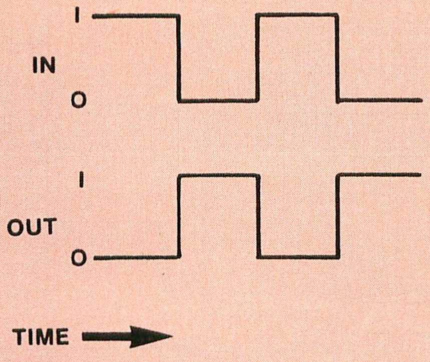
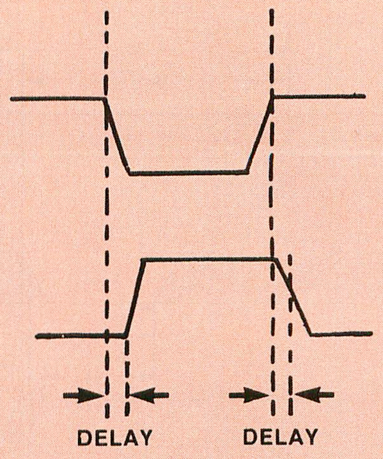


Figure 1c



the delay of the signal there is also the *rise* and *fall* time. The rise time of a signal is described as the time it takes for a given signal to reach 90 percent of maximum voltage from the 10 percent voltage level. The fall time of a signal is described as the time it takes for a given signal to drop to 10 percent voltage from the 90 percent voltage level. In the case of the CoCo, the voltage considered a logical level of '1' (or HI) is five volts. The logical level '0' (or LO) is, of course, zero volts. The actual working voltages may be slightly different.

Delay, rise and fall times are important mainly to the designer of the system. When an engineer designs a computer he must know these timings and make sure that all operations are within the given limits. For example, two signals go to one gate, but one goes through several gates first. Each time the signal travels from one gate to another there is more delay. If the signal is delayed enough, an improper signal output results.

It sounds like I'm making a big deal of delays. While it is important, it is not a major concern to computer hackers (or should I use the term hobbyist?) and even less to end users. More important to us is another kind of delay. It is known as "access time," which means the mean time between the request for memory and the actual valid data.

Let us look at a typical memory chip. There are thousands of gates and transistors inside this chip. All of these gates inside the chip cause a significant delay between the time when the address to the chip is valid and the time when the data output appears on the data bus. This is known as access time. When talking about memory, an important parameter is access time. These access times can range from super-fast static memory at about 10 ns to very slow dynamic memory at 450 ns and slower. It is this limitation that controls and limits the speed of CPUs. Figure 2a shows the read cycle timing diagram of a memory chip. Figure 2b shows the write cycle for the same chip. What follows is a description of what each line on the diagram means.

> ***"More important to us is another kind of delay. It is known as 'access time,' which means the mean time between the request for memory and the actual valid data."***

Address — These are the address lines that select what byte is to be accessed. It is shown with two lines, one high and one low. It is shown this way because there are usually several lines and since the timing is the same no matter what byte you access, it is not relevant which address line is high or which line is low. The two lines (one on top and one on the bottom) represent any given address within the chip. Where the lines crisscross means a change of address. That is when the CPU is finished with that byte and requests another by putting another address on the bus. Access times are always measured with respect to the address change from the CPU. Actually, it starts when the address is stable, better known as a "valid address."

Chip Select (CS) — Remember the *CS line on memory chips in past articles? It is used to select or activate the chip. From the diagram of the read cycle, we can now see the relation between when the address is valid, the *CS line and when the data is valid.

Data out — This, of course, is the data that the CPU requested. Notice the data valid area. That is the time when the data that appears on the bus is the data that is held in that memory location. Notice the top and bottom dual line display. It has the same description as address lines, some are ones and some are zeros. The line in front of the data valid section is halfway between zero and one. That means the data lines are tri-state and no valid data is input or output. The shaded area on both sides of the data valid window is the transition time between tri-state and data valid. In this area, data lines are changing to their proper values. A read in this area will not yield valid data.

Figure 2a

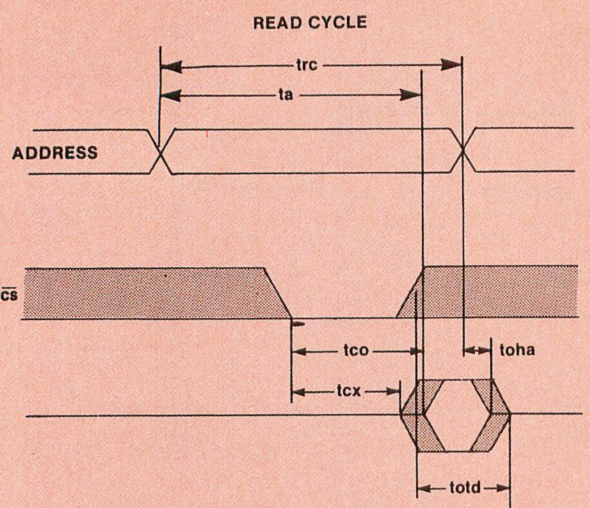
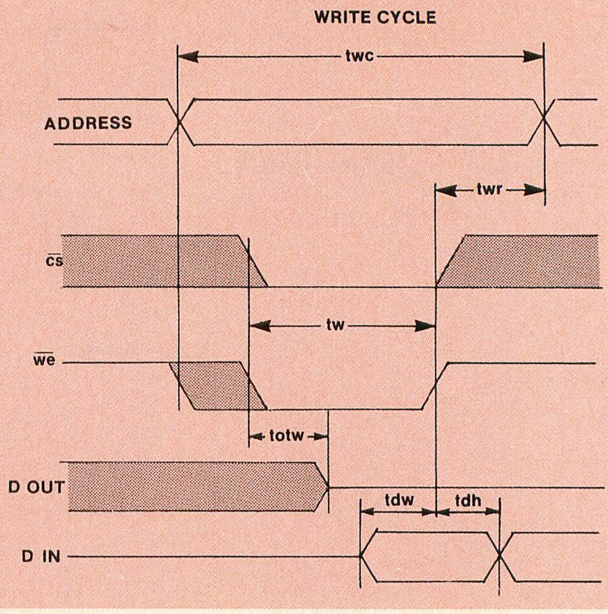


Figure 2b



Read/Write — The *R/W line is used to select a read cycle or a write cycle. Straightforward, no problems there. In the CoCo this line is logical '1' to read and '0' to write.

The following is a description of all the relevant parameters used in Figures 2a and 2b.

t(rc) — Read Cycle Time: the time it takes for a complete read cycle given in ns.

t(a) — Access Time: the delay between a valid address and data valid.

t(co) — Chip Select to Output Valid: the delay between when the *CS is active and the data is valid. This is only true with a valid and stable address.

t(cx) — Chip Select to Output Active: same as t(co) but not to data valid; to when the data lines start changing from tri-state to output. Usually of minor importance.

t(otd) — Output Tri-state from Deselection: the time that the data stays valid after the *CE goes inactive or deselects.

t(oha) — Output Hold from Address Change: the time that the data stays valid after an address change is detected.

t(wc) — Write Cycle Time: same as the t(rc) except for a write cycle.

t(w) — Write Time: the minimum time the write line has to remain low.

t(wr) — Write Release Time: time between the *WE line deselects and a change of address.

t(otw) — Output Tri-state from Write: the time it takes the data lines to go to tri-state from a write request.

t(dw) — Data to Write Time Overlap: the time data must be stable before the *WE line deselescts.

t(dh) — Data Hold from Write Time: the time data must be stable after the *WE line deselects.

Figures 2a and 2b show the read and write cycle paramaters for a typical memory chip. Though these are not the memory chips inside the CoCo, the timing and paramaters are quite similar.

Now with no further *delays*, it is time to look into the CPU . . . well, sort of! There is one more thing we must look into; it is CPU related, though. We are getting closer. It is the master clock, which is a master reference wave form used to synchronize all of the logic in a system.

The master clock is usually the highest frequency in the computer. All other timings are derived (divided) from this clock. The CPU clock is the speed or frequency at which all instructions and data are retrieved and stored to memory. Depending on the system design, the CPU clock can be equal to the master clock, or any division thereof. In the case of the CoCo, the master clock frequency is 14.31818 MHz (mega-hertz or million hertz) and the CPU clock frequency is 1/16 that of the master clock at 0.8948 MHz. Well, there are two clock speeds in the CoCo. Under special conditions, the CPU can work at 1.8 MHz.

Now you might say, "Wow, my CoC has a clock rate of only .894 MHz!" Compared to that of the 4 MHz of othe computers, that may or may not b slower. You see, it gets more complicated. The CPU clock does not alway mean the net speed of the computer There are some other factors involved such as synchronous I/O, as opposed t asynchronous I/O.

Let's look at synchronous I/O first. As the word implies, synchronous I/O means that any memory, read or write, is synchronized. Synchronized to what? The CPU clock, of course. On any given clock cycle, the CPU can do one I/O. You know exactly when the CPU will need the bus. It corresponds to the clock cycle. In an asynchronous situation, the CPU requires more than one clock cycle to do a read or write. Asynchronous I/O requires either three or four cycles depending on what kind of I/O it is doing. On this type of CPU, signals are required to tell memory or other devices that an I/O has started.

Just about now, a little bit of math is required. Given that the clock frequency of the CoCo is 894886 hertz or 0.894 MHz, one clock cycle is 1117 nanoseconds. The way I did this is to transfer from frequency to time period. The equation used is:

$$T = 1/F$$

where 'T' is in seconds and 'F' (frequency) is in hertz. So the frequency of 0.894 MHz is a time period of .000001117 seconds, or 1117 nanoseconds, or 1.117 microseconds. Now, when we talk about speed, we can say that the CoCo can do about one I/O per microsecond — a much more accurate way to measure the effective speed of a CPU.

I hope these articles about the hardware of the CoCo are informative to you. Also, I hope I am not going too fast; it is hard for me to judge what audience I am writing for. If you have some comments to make, a direction to take or something you don't understand, write to me through RAINBOW and I'll try to answer the interesting and common ones here in this column. Next time, we'll look deeper into the heart of the CoCo.

Figure 3

READ CYCLE

SYMBOL	PARAMETER	MIN	MAX	UNIT
tpc	READ CYCLE TIME	250		NS
ta	ACCESS TIME		250	NS
tco	CHIP SELECT TO OUTPUT		85	NS
tcx	CHIP SELECT TO OUTPUT	10		NS
totd.	OUTPUT TRI-STATE FROM DESELECTION	15		NS
toha	OUTPUT HOLD FROM ADDRESS CHANGE		20	NS

WRITE CYCLE

SYMBOL	PARAMETER	MIN	MAX	UNIT
twc	WRITE CYCLE TIME	250		NS
tw	WRITE TIME	135		NS
twr	WRITE RELEASE TIME	0		NS
totw	OUTPUT 3-STATE FROM WRITE		60	NS
tdw	DATA TO WRITE TIME OVERLAP	135		NS
tdh	DATA HOLD FROM WRITE TIME	0		NS

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Block! Kick! Duck! No, it's not a game of football, but a rollicking session of . . .

Kung Fu Fighting

By Larry Wolcott

It all started when I walked into the local arcade to find the latest game surrounded by crowds of people. As I pushed my way through to see what it was, I heard people excitedly yelling, "Block! kick!" This got me working day and night, trying many different approaches to my program, *Kung Fu Fighter.*

Here's the game setting: You are the man on the left of the screen. As soon as the game board appears, the opponent charges from the right. You must defend yourself against the enemy with your deadly kicks and punches, while at the same time duck and block your opponent's assaults. The controls work like this:

Right arrow — kick
Left arrow — punch
Up arrow — block
Down arrow — duck
'Q' key — move left
'@' key — move right

After striking your opponent 20 times, he falls and your score, level and energy points are displayed; the higher the level, the less the time interval between your opponent's kicks and punches, and he will be able to duck and block your assaults more often. When your energy points run out, so does your life.

I have used the keyboard `PEEK`s instead of the slow `INKEY` command to speed the program — this makes auto kicking, punching, etc. I have also used the `POKE 65495,0` to speed the program. If your computer can't handle it, just delete it from the program.

The score is increased by five points every time you punch your enemy, and 10 points every time you kick him. Energy points decrease when you are struck by your opponent (you start with 25).

After loading *Kung Fu Fighter*, run it until it gets to the title screen, then press `BREAK` and run it again. This only has to be done once, right after loading (because once in a while, the `GET`s do not "get"). The program is compiled in this order:

Lines	Function
0-70	Set variables
230-670	`DRAW` and `GET` figures
680-840	Draw title screens
890-990	Check keyboard for keys pressed
1000-1900	Kick, punch, duck, walk and block subroutines
1950-2110	End of game titles

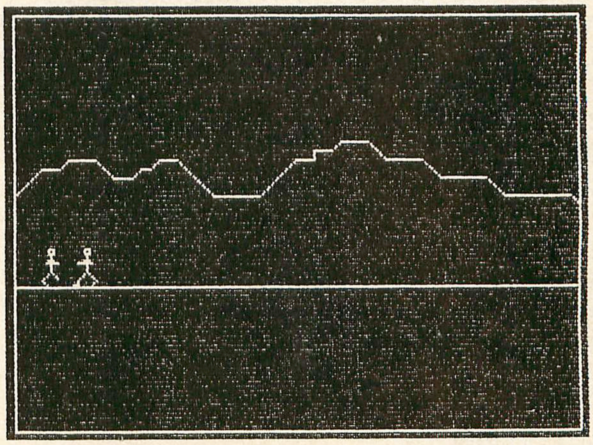
☐

Larry Wolcott has owned a CoCo for about four years. He is a self-taught programmer. He attends Daniel Webster Junior High School in Milwaukee, Wisconsin and enjoys computers and electronics.

270	61
460	204
630	200
780	152
980	31
1180	25
1380	220
1630	158
1830	24
1990	223
END	228

The listing: KUNG FU

```
0 HS=750
10 A=0:A1=0
20 POKE 65495,0
30 L=1
40 X=20:Y=107:X1=232:Y1=107
50 I=.1
60 U=8
70 B=1:B1=1
80 '
90 '
100 '
110 '         kung-fu
120 '         fighter
130 '
140 '    BY: LARRY WOLCOTT
150 '
160 '   (C) 1985-VERSION 1.1
170 '
180 '
190 '       PORK N' BEAN
200 '        SOFT-WARE
210 '
220 '
230 DIMM(8,8):DIMBL(8,8):DIMBR(8
,8)
240 DIML(8,8):DIMSR(8,8):DIMSL(8
,8)
250 DIMR(8,8):DIMKR(8,8):DIMKL(8
,8)
260 DG=25
270 DIMRT(8,8):DIMLT(8,8):DIMDR(
8,8):DIMDL(8,8)
280 CLS
290 PCLS
300 DRAW"BM20,4R1D2L2U2R1L1D2R1D
2G2H2F2E2F2E2G2H2D6G4D2L2R2U2E4F
4D2R2"
310 GET(12,4)-(28,20),M
320 PCLS
330 DRAW "BM20,4R1D2L2U2R1L1D2R1
D2F2R2L6E2D6G4F2H2E4F4D2R2"
340 GET(12,4)-(28,20),R
350 PCLS:DRAW "BM20,4R1D2L2U2R1L
1D2R1D2F2L6R2E2D6G4D2L2R2U2E4F4G
2"
360 GET(12,4)-(28,20),L
370 PCLS
380 DRAW "BM20,4R1D2L2U2R1L1D2R1
D2G2F2H2E2D8D4R2"
390 GET(12,4)-(28,20),RT
400 PCLS
410 DRAW "BM20,4R1D2L2U2R1L1D2R1
D2F2G2E2H2D12L2"
420 GET(12,4)-(28,20),LT
430 PCLS
440 DRAW "BM20,4R1D2L2U2R1L1D2R1
D2R8L8G3R4L4E3D6F4D2R2L2U2H4G4D2
R2"
450 GET(12,4)-(28,20),SR
460 PCLS
470 DRAW "BM20,4R1D2L2U2R1L1D2R1
D2L8R8F3L4R4H3D6G4D2L2R2U2E4F4D2
L2"
480 GET(12,4)-(28,20),SL
490 PCLS
500 DRAW "BM20,4R1D2L2U2R1L1D2R1
D2R4L4G4R4L3E3D6R2E2R2E2U2D2G2L2
G2L2G4D1R2"
510 GET(12,4)-(28,20),KR
520 PCLS
530 DRAW "BM20,4R1D2L2U2R1L1D2R2
D2L4R4F3L4R4H3D6L2H2L2H2U2D2F2R2
F2R2F4D1L2"
540 GET(12,4)-(28,20),KL
550 PCLS
560 DRAW "BM20,4R1D2L2U2R1L1D2R1
D2L4D2U2R4F3L6D2U2R6H3D6G4D2L2R2
U2E4F4D2L2"
570 GET(12,4)-(28,20),BL
580 PCLS
590 DRAW "BM20,4R1D2L2U2R1L1D2R1
D2R4D2U2L4G3R6D2U2L6E3D6F4D2R2L2
U2H4G4D2R2"
600 GET(12,4)-(28,20),BR
610 PCLS
620 DRAW "BM20,12R4U1R2D2L2U1L2D
4U4L2D2G4D2R2L2U2E4F4D2R2"
630 GET(12,4)-(28,20),DR
640 PCLS
650 DRAW "BM20,12L4U1L2D2R2U1R2D
4U4R2D2G4D2L2R2U2E4F4D2L2"
660 GET(12,4)-(28,20),DL
670 PCLS
```



```
680 PMODE4,1:PCLS:SCREEN1,1
690 LINE(4,4)-(252,188),PSET,B
700 DRAW "BM72,16R8D8R4U4E4R8G4D
4G4R4D4R4D4R4D8L8U4L4U4L4U4L4D12
L8U28BR28R8D8F4D12U12E4U8R8D12G4
D8G4L8H4U8H4U12BR28"
710 DRAW "R12F8U8R8D28L8U8H12D12
G4D4L8U8E4U16BR32BR4G4D20F4R16E4
U12L12D8R4G4L4H4U12E4R8F4R4U4H4L
16G4"
720 DRAW "BM100,52R20F4D8L4H4L8D
8R8D8L12D4L8U12E4U12BR28R8D8F4D1
2U12E4U8R8D12G4D8G4L8H4U8H4U12":
PAINT(76,20),5:PAINT(152,20),5:P
AINT(104,20),5:PAINT(180,20),5:P
AINT(104,56),5
730 PAINT(132,56),5:PMODE 4,1:SC
REEN1,1
740 PLAY "V31;O1;T5;L5;1;1;1;L2;
1;L5;3;P3;3;L2;3;P4;L5;2;2;P3;L5
;1;2"
750 CLS:PRINT:PRINT "***********
*******************"
760 PRINT:PRINT "        kung-fu
fighter         "
770 PRINT:PRINT "        BY: LARRY
 WOLCOTT"
780 PRINT "           VERSION 1.1"
790 PRINT "              (C)1985"
800 PRINT:PRINT "         PORK N
' BEAN "
810 PRINT "           SOFTWARE"
820 PRINT:PRINT "        PRESS
ANY KEY"
830 PRINT:PRINT "***************
***************"
840 I$=INKEY$:SCREEN0,1:IFI$=""T
HEN 840
850 PCLS
860 LINE(4,4)-(252,188),PSET,B
870 LINE(4,124)-(252,124),PSET
880 DRAW"BM4,84E12R8E4R12F8R8E4R
4E4R8F16R20E16R8U4R8E4R12F8R16F8
R20F8R16R4R8F4"
890 PMODE4,1:SCREEN1,1
900 I$=INKEY$
910 IFPEEK(344)=247THENGOSUB1050
920 IFPEEK(343)=247THENGOSUB1260
930 IFPEEK(342)=247THENGOSUB1440
940 IFPEEK(341)=247THENA=3
950 IFPEEK(339)=251THENGOSUB1560
960 IFPEEK(338)=254THENGOSUB1500
970 IFA=4THENPUT(X-8,Y)-(X+8,Y+1
6),DR ELSE IFA=3THENPUT(X-8,Y)-(
X+8,Y+16),BR ELSEPUT(X-8,Y)-(X+8
,Y+16),R
980 IFA1=4THENPUT(X1-8,Y1)-(X1+8
,Y1+16),DL ELSE IFA1=3 THENPUT(X
1-8,Y1)-(X1+8,Y1+16),BL ELSE PUT
(X1-8,Y1)-(X1+8,Y1+16),L
990 IFX1>X+18THENGOSUB1630
1000 IFX1<X THENGOSUB1690
1010 C=C+I:IFC>1THENC=0:GOSUB175
0
1020 IF H>20 THEN 1890
1030 IF DG<0 THEN 2030
1040 GOTO 900
1050 IFRND(10)>=U THEN A1=4
1060 IF X1<X+10 THEN 1070 ELSE 1
150
1070 A=0:IF A1=4THEN1150
1080 LINE(X-8,Y)-(X+8,Y+16),PRES
ET,BF
1090 PUT(X-8,Y)-(X+8,Y+16),KR
1100 PLAY"T255;V31;12;12;12;12;1
2"
1110 LINE(X-8,Y)-(X+8,Y+16),PRES
ET,BF
1120 SC=SC+10:H=H+1
1130 A=0
1140 RETURN
1150 LINE(X-8,Y)-(X+8,Y+16),PRES
ET,BF
1160 LINE(X1-8,Y1)-(X1+8,Y1+16),
PRESET,BF
1170 PUT(X1-8,Y1)-(X1+8,Y1+16),D
L
```

BASIC COMPILER

WASATCHWARE believes that users of the Color Computer deserve the right to use all 64k of RAM that is available in the computer, and have fast machine language programs that use the full potential of the 6809 microprocessor. That is why the BASIC compiler, called MLBASIC was developed. Here are some of the reasons that make this compiler one of the best bargains in this magazine:

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- Full sequential and direct access disk files allowed
- BASIC source and M.L. output I/O to disk, tape or memory

COMMANDS SUPPORTED

1. I/O -Commands
   CLOSE CLOADM CSAVEM DIR DRIVE DSKI$
   DSKO$ FIELD FILES GET INPUT KILL
   LSET OPEN PRINT PUT RSET
2. Program Control Commands
   CALL END EXEC FOR STEP NEXT
   GOSUB GOTO IF THEN ELSE ERROR
   ON..GO RETURN STOP SUBROUTINE
3. Math Functions
   ABS ASC ATN COS CVN EOF
   EXP FIX INSTR INT LEN LOG
   LOC LOF PEEK POINT PPOINT RND
   SGN SIN SQR TAN TIMER VAL
4. String Functions
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```
1180 PUT(X-8,Y)-(X+8,Y+16),KR
1190 PUT(X1-8,Y1)-(X1+8,Y1+16),D
L
1200 PLAY"T255;V31;1;1;1;1"
1210 LINE(X-8,Y)-(X+8,Y+16),PRES
ET,BF
1220 LINE(X1-8,Y1)-(X1+8,Y1+16),
PRESET,BF
1230 A1=0
1240 A=0
1250 RETURN
1260 IFRND(10)>U THEN1360
1270 IF A1=3 OR A1=4THEN1360
1280 IFX1<X+10THEN1290ELSE1360
1290 LINE(X-8,Y)-(X+8,Y+16),PRES
ET,BF
1300 PUT(X-8,Y)-(X+8,Y+16),SR
1310 PLAY"T255;V31;12;12;12;12"
1320 LINE(X-8,Y)-(X+8,Y+16),PRES
ET,BF
1330 SC=SC+5:H=H+1
1340 A=0
1350 RETURN
1360 LINE(X1-8,Y1)-(X1+8,Y1+16),
PRESET,BF
1370 LINE(X-8,Y)-(X+8,Y+16),PRES
ET,BF
1380 PUT(X-8,Y)-(X+8,Y+16),SR
1390 PUT(X1-8,Y1)-(X1+8,Y1+16),B
L
1400 PLAY "T255;V31;1;1;1;1"
1410 LINE(X-8,Y)-(X+8,Y+16),PRES
ET,BF
1420 A=0
1430 RETURN
1440 A=4
1450 PUT(X-8,Y)-(X+8,Y+16),DR
1460 PUT(X-8,Y)-(X+8,Y+16),DR
1470 LINE(X-8,Y)-(X+8,Y+16),PRES
ET,BF
1480 A=4
1490 RETURN
1500 A=0:LINE(X-8,Y)-(X+8,Y+16),
PRESET,BF
1510 X=X+2
1520 PUT(X-8,Y)-(X+8,Y+16),RT
1530 LINE(X-8,Y)-(X+8,Y+16),PRES
ET,BF
1540 X=X+2
1550 RETURN
1560 A=0:LINE(X-8,Y)-(X+10,Y+16)
,PRESET,BF
1570 X=X-2
1580 PUT(X-8,Y)-(X+8,Y+16),RT
1590 LINE(X-8,Y)-(X+10,Y+16),PRE
SET,BF
```

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```
1600 X=X-2
1610 PUT(X-8,Y)-(X+8,Y+16),R
1620 RETURN
1630 LINE(X1-8,Y1)-(X1+8,Y1+16),
PRESET,BF:X1=X1-2
1640 PUT(X1-8,Y1)-(X1+8,Y1+16),L
T
1650 LINE(X1-8,Y1)-(X1+8,Y1+16),
PRESET,BF
1660 X1=X1-2
1670 IF DG<=0 THEN 2030
1680 RETURN
1690 LINE(X1-8,Y1)-(X1+8,Y1+16),
PRESET,BF
1700 X1=X1+2
1710 PUT(X1-8,Y1)-(X1+8,Y1+16),L
T
1720 LINE(X1-8,Y1)-(X1+8,Y1+16),
PRESET,BF
1730 X1=X1+2
1740 RETURN
1750 IFX1>X+10THENRETURN
1760 IFX1<X THENRETURN
1770 IFA=3 OR A=4THEN1840
1780 LINE(X1-8,Y1)-(X1+8,Y1+16),
PRESET,BF
1790 IF1=1 THENPUT(X1-8,Y1)-(X1+
8,Y1+16),KL ELSE PUT(X1-8,Y1)-(X
1+8,Y1+16),SL
1800 DG=DG-1
1810 PLAY "O5;T255;12;11;10;9;8"
1820 LINE(X1-8,Y1)-(X1+8,Y1+16),
PRESET,BF
1830 RETURN
1840 LINE(X1-8,Y1)-(X1+8,Y1+16),
PRESET,BF
1850 IFRND(2)=2THENPUT(X1-8,Y1)-
(X1+8,Y1+16),SL ELSEPUT(X1-8,Y1)
-(X1+8,Y1+16),KL
1860 LINE(X1-8,Y1)-(X1+8,Y1+16),
PRESET,BF
1870 PLAY "O5;T255;1;1;1;1"
1880 RETURN
1890 LINE(X1-8,Y1)-(X1+8,Y1+16),
PRESET,BF
1900 PLAY "O4;T6;2;3;4;5;6;P3;5;
6;P3;5;6;P2;4;P3;1;2;3;4;5;P3;6;
L1;4"
1910 PLAY "T10;P1;O5;T10;12;P3;1
1;11;10;10;9;9;L3;8"
1920 PUT(X1-8,Y1)-(X1+8,Y1+16),D
L,OR
1930 PUT(X-16,Y)-(X,Y+16),M
1940 PLAY "O4;T15;1;2;1;2;3;2;3;
3;4;3;4;4;5;4;5;5;6;5;6;6;7;6;7;
7;8;7;7;8;9;8;8;9;8;9;9;10;11;12
;12;12;12"
1950 CLS
1960 PRINT @0,"YOUR SCORE>>";SC:
L=L+1
1970 PRINT "YOUR LEVEL NOW>>";L:
PRINT "YOUR ENERGY POINTS>>";DG
1980 PRINT:PRINT:PRINT:PRINT:PRI
NT "          PRESS ANY KEY
  "
1990 I$=INKEY$
2000 IF I$=""THEN 1990
2010 X=50:X1=200:H=0:I=I+.1:GOTO
 850
2020 GOTO 2020
2030 PLAY "O1;T15;12;11;12;11;10
;9;10;9;8;9;7;8;6;7;5;6;4;5;3;4;
2;3;1;2;1;1;1"
2040 CLS
2050 PRINT "-=-=-=-=-=high score
=-=-=-=-=-="
2060 PRINT ">>>>";HS
2070 PRINT "YOUR SCORE>>>>";SC
2080 PRINT:PRINT:PRINT:PRINT:IF
SC>HS THEN HS=SC:PRINT "********
*NEW HIGH SCORE********"
2090 PRINT:PRINT "          PRESS
 ANK KEY          "
2100 I$=INKEY$:IF I$="" THEN 210
0
2110 GOT0 10
```

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Financing: The Economic Advantage

By Bill Bernico

Having been a car salesman for six years and a car rental manager for another four years, I've learned a lot about human nature and how people spend their money. Folks purchasing a new car might think that by taking the money out of their savings account to pay cash for their purchase that they are saving all that interest on the loan. Surprise! They've actually lost money doing it that way. This program will show in cold, hard figures which is the more economical move. It will also give skeptics a printout to take home and think about if they are not initially convinced after running the program.

When using *Cash vs. Financing*, input the same dollar amounts and the same number of months in each case. In other words, compare "apples with apples." (Or should I say "CoCos with CoCos.") If you're considering a $10,000 car and you have that amount in the bank, use $10,000 in the financing section of the program in order to get an honest comparison.

Bill Bernico is a car rental manager at a Dodge garage in Sheboygan, Wisconsin. His dealership-related programs were born out of necessity. Bill is 35 and a self-taught computerist who also enjoys playing golf.

Naturally, the input for interest will vary between savings and financing, but use the same number of months in the comparison. Let's go through a sample session. For savings amount, input $10000 (no commas). For savings interest, let's use 8.75 (no percent sign necessary) and for months, input 48. Compound periods in this sample will be 2. The program will show you that by the end of the 48 month period, your nest egg will be worth $14085.49 or a gain of $4085.49 in interest.

This will put you into the finance part of the program. Your first input will be the finance amount. Again, use $10000. For finance interest, use 13.5 (even at this higher rate, you'll be surprised by the outcome). For the number of finance months, again use 48 and it will show you that your monthly payment will be $270.76 or a total of $12996.48 over 48 months. The interest you will have paid in those 48 months is $2996.48.

Comparing this figure with the $4085.49 in interest you would have earned from the savings account, you can see that you've saved $1089.01 by financing and leaving your nest egg alone. If you can find finance rates lower than 13.5, then the savings will be that much more.

At this point in the program, if the customer has still not been convinced to finance the car, the salesman can select from three options. Option 1 is a printout of the comparison. Option 2 is to start over with new figures. Option 3 is to end the program.

Option 1, the printout, will ask for the customer's name as well as the salesman's name. After the salesman inputs his name, the program will send the information to the printer. (This printout was tailored for the TP-10 printer which we have in our showroom, but will work with other printers as well.) The printout will personalize the hardcopy that the customer gets. It also has the dealership name and address as well as the salesman who serviced him. It's nice to stay fresh in the customer's mind.

Here is a sample printout from the program we just ran. This program need not be restricted to automobile purchases. It can be used on any item you like for comparison purposes.

One last note: I have fictionalized the name of the dealership in the printout as per my employer's request, and my apologies if there is really someone out there by the name of "Joe Average."

(Questions about *Cash vs. Financing* may be directed to Mr. Bernico at 708 Michigan Avenue, Sheboygan, WI 53081, phone 414-459-7350.) □

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AFTER ALL, why pay for something you can't see?
(ask your Software Dealer)

Do it all BEFORE you purchase the program!
(ask your software dealer)

Sample Printout

```
       HOMETOWN DODGE
   1234 NORTH 56TH STREET
    SHEBOYGAN, WI   53081
       (414) 555-4861
ASK FOR BILL BERNICO

SAVINGS AMOUNT.... 10000
SAVINGS INTEREST.. 8.75 %
SAVINGS MONTHS.... 48
COMPOUND PERIODS.. 2
SAVINGS AMOUNT
AFTER 48 MONTHS... 14085.49
INTEREST GAINED... 4085.49

--------------------------------

FINANCE AMOUNT.... 10000
FINANCE INT....... 13.5 %
FINANCE MONTHS.... 48
MONTHLY PMT....... 270.76
TOTAL OF PMTS..... 12996.48
TOTAL INTEREST.... 2996.48

JOE AVERAGE CAN SAVE $ 1089.01
BY FINANCING THIS VEHICLE

ASK US FOR ASSISTANCE IN
ARRANGING A LOAN FOR YOU.
```

```
230 .......40
430 ......211
620 ......133
END ......70
```

The listing: CASH

```
10 '***        CASH          ***
20 '*** BY BILL BERNICO ***
30 '*** 708 MICHIGAN AV.***
40 '***   SHEBOYGAN, WI    ***
50 '***        53081         ***
60 '***   (414)459-7350    ***
70 '***                      ***
80 CLS:B$=CHR$(128)
90 PRINT@43,"advantages";B$;"of
100 PRINT@107,"financing";B$;"vs
110 PRINT@171,"paying";B$;"cash
120 PRINT@299,"COURTESY OF"
```

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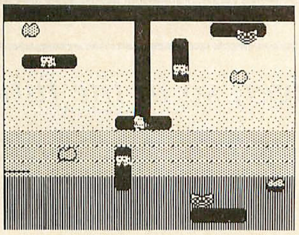
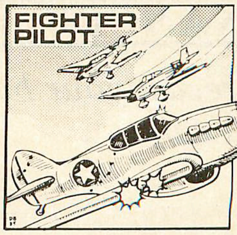
```
130 PRINT@363,"HOMETOWN DODGE
140 PRINT@484,"(HIT ANY KEY TO C
ONTINUE)";
150 EXEC 44539
160 A=0:I=0:T=0:Y=0:V=0:L=0:P=0:
X=0:N=0:K=0:O=0:U=0:E=0
170 CLS
180 INPUT"SAVINGS AMOUNT......";
A
190 INPUT"SAVINGS INTEREST....";
I:I=I/100
200 INPUT"SAVINGS MONTHS......";
T:T=T/12
210 INPUT"COMPOUND PERIODS....";
Y
220 V=A*(1+I/Y)^(Y*T):V=INT(V*10
0+.5)/100
230 PRINT"AFTER";T*12;"MONTHS...
..$";V
240 L=V-A
250 PRINT"INTEREST GAINED.....$
";L
260 PRINTSTRING$(32,"-");
270 INPUT"FINANCE AMOUNT......";
P
280 INPUT"FINANCE INTEREST....";
X:X=X/100
290 INPUT"FINANCE MONTHS......";
N
300 K=P*(X/12)/(1-(1+(X/12))^-N)
310 K=INT(K*100+.5)/100
320 PRINT"MONTHLY PAYMENT.....$
";K
330 O=K*N
340 O=INT(O*100+.5)/100
350 PRINT"TOTAL OF PAYMENTS...$"
;O
360 U=INT((O-P)*100+.5)/100
370 PRINT"TOTAL INTEREST......$
";U
380 E=INT((L-U)*100+.5)/100
390 PRINT"AMOUNT SAVED
400 PRINT"BY FINANCING........$
";E
410 PRINT@482,"pRINTOUT  sTART O
VER  eND";
420 A$=INKEY$:IF A$=""THEN 420
430 IF A$="S"THEN 160
440 IF A$="P"THEN 470
450 IF A$="E"THEN 10
460 GOTO 420
470 CLS:INPUT"CUSTOMER'S NAME";C
N$
480 INPUT"SALESMAN'S NAME";SN$
490 CLS:PRINT@232,"....PRINTING.
...
500 PRINT#-2,"         HOMETOWN D
ODGE
```

```
510 PRINT#-2,"      1234 NORTH 56T
H STREET
520 PRINT#-2,"      SHEBOYGAN, WI
   53081
530 PRINT#-2,"          (414) 555
-4861
540 PRINT#-2,"ASK FOR ";SN$
550 PRINT#-2
560 PRINT#-2,"SAVINGS AMOUNT....
";A
570 I=I*100
580 PRINT#-2,"SAVINGS INTEREST..
";I;"%
590 T=T*12
600 PRINT#-2,"SAVINGS MONTHS....
";T
610 PRINT#-2,"COMPOUND PERIODS..
";Y
620 PRINT#-2,"SAVINGS AMOUNT"
630 PRINT#-2,"AFTER";T;"MONTHS..
.";V
640 PRINT#-2,"INTEREST GAINED...
";L
650 PRINT#-2
660 PRINT#-2,"-----------------
------------
670 PRINT#-2
680 PRINT#-2,"FINANCE AMOUNT....
";P
690 X=X*100
700 PRINT#-2,"FINANCE INT.......
";X;"%
710 PRINT#-2,"FINANCE MONTHS....
";N
720 PRINT#-2,"MONTHLY PMT.......
";K
730 PRINT#-2,"TOTAL OF PMTS.....
";O
740 PRINT#-2,"TOTAL INTEREST....
";U
750 PRINT#-2
760 PRINT#-2,CN$;" CAN SAVE $";E
770 PRINT#-2,"BY FINANCING THIS
VEHICLE
780 PRINT#-2
790 PRINT#-2,"ASK US FOR ASSISTA
NCE IN
800 PRINT#-2,"ARRANGING A LOAN F
OR YOU.
810 PRINT#-2:PRINT#-2:PRINT#-2:P
RINT#-2:PRINT#-2:PRINT#-2
820 CLS:PRINT@481,"aNOTHER PRINT
OUT  rESTART  eND";
830 A$=INKEY$:IFA$=""THEN830
840 IF A$="A"THEN 500
850 IF A$="R"THEN 160
860 IF A$="E"THEN 10
870 GOTO 830
```





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Tape $24.95
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A fantasy graphics adventure. You are Garotte Severinn, master thief, spy, and assassin. Your mission is to kill the evil wizard Neeman, recover the holy scepter of Tash, and escape from Neeman's castle. The reward is a fortune in gold, but beware...many dragons and monsters stand between you and the gold! 32K, one disk drive required.

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Forecast your budget, so in the future you can . . .

Juggle Bills, Juggle Bills, Juggle All the Way!

By Glen Dufur

This program, *Home Budget Analysis*, is used to assist in budgeting and forecasting personal finances in order to plan and adjust cash flow for three future periods (paydays). The program allows you to enter and update income and expense items for each of the three periods. The total of income and expenses is calculated and displayed for instant analysis of cash flow, as items are added or updated. The balance is money that has not been committed, or over-committed, if a negative balance is calculated.

As a period passes, you may shift all amounts so the second period becomes current and a new third period is opened. This allows you to continue budgeting for future periods. Also the ability is given to save or load a file of personal finance data.

Create New File/Load Existing File

You are given two options upon running the program. Press 'C' to create a new file or 'L' to load an existing file.

- Create New File: You are prompted to enter the dates of the three future periods to be budgeted. Enter each period date in the format "MM/DD."
- Load Existing File: You are prompted to ready the cassette. Press any key when ready to load the file.

Upon completion of entering the dates for creation of a new file or loading an existing file, the INCOME DISPLAY appears. You are now ready to begin entry or update of your personal finance file.

Add/Update/Delete Expense and Income Items

Income items are accessed via the income display, expense items via the expense display. Press 'N' to add a new item, or "A-H" to update or delete an existing item. Be sure to include all known income and expenses that occur during each period, for example, groceries, car expenses, rent, utilities, installment payments, savings, wages and other income.

- Add Item: A prompt is given to enter the DESCRIPTION. A description is required for each item entered. You are then prompted to enter an AUTO AMOUNT. This amount is automatically entered for each period of the item being added. Press ENTER without an amount if you do not wish an auto amount. This function is handy when the amount is the same for each period. You are now ready to enter amounts for the added item (see Update).
- Update Item: When updating an item, the display prompts for the period to update, '1', '2' or '3'. Enter the proper period and a prompt appears to enter the AMOUNT. To change the description and/or auto amount, press 'D'. A prompt appears to enter the new description. You are then prompted to enter the auto amount.
- Delete Item: After selecting the item to be deleted, press '*'. The item is deleted and you are automatically returned to the income or expense display.

Press 'R' to return to the income or expense display.

Expense and Income Displays

The income and expense displays list the items that represent the total of expenses and income. Options are available to move between the expense and income displays, in addition to adding or updating items. Press 'I' while in the expense display to call the income display. The expense display may be recalled by pressing 'X'.

Scrolling of items is accomplished by the up/down arrows while in either display. The last entry on the screen appears at the top when scrolled down and vice versa when scrolled up.

The calculated total of expenses and income is shown for each period with the balance of uncommitted or overcommitted amounts.

Glen Dufur, a senior programmer analyst with Airborne Freight Corporation, lives in Issaquah, Washington. He has been designing and programming mainframe computer systems for 12 years.

Open New Period

As a period has past, you may delete the current period and move all income and expenses forward and, therefore, open a new period.

Press 'O' while in the expense or income display. The function prompts you to enter the date of the new period in the form "MM/DD." The program automatically shifts all amounts and drops the values for the current period. If you had entered an auto amount for any income or expense item, this amount is automatically entered into the new period for the item.

Technical Information

A maximum of 25 expense items and five income items have been imposed. Should your budget require more items, change the value of EN (expense items) and IN (income items) in Line 3000.

Logic Flow

Frequent Subroutines

10	INKEY
12	prompt alarm
15	blank two lines
20	top line
25	bottom line
30	screen load expenses
45	screen load income
60	calculate and print totals

Other Subroutines

100	accept desc/default
120	delete expense
130	delete income
140	accept amount
150	basic screen
170	item screen
185	item bottom query
190	file full
300	expense display
400	expense item update
500	income display
600	income item update
700	shift period
800	LOAD and SAVE
900	new file
1000	initialize and start
1100	menu
2000	PCLEAR

Variables

ED$(EN)	expense description
EA(EN,3)	expense amount
DE(EN)	expense default
LE	last record expense
ID$(IN)	income description
IA(IN,3)	income amount
DA(IN)	income default
LI	last record income
PD$(3)	period dates
TE(3)	period total expense
TI(3)	period total income
PB(3)	period balance
EN	maximum expense records (preset to 25)
IN	maximum income records (preset to 5)
IE$	flag E=expense, I=income
I(8)	item addressability
IX$(8)	item addressability
I$(8)	item addressability

(Any questions about *Home Budget Analysis* may be sent to the author at 19816 SE 123rd, Issaquah, WA 98027, phone 206-235-3474. Please enclose an SASE when writing.) ☐

The listing: HOMEBDGT

40	33	610	78
80	179	720	82
130	99	835	89
170	1	997	15
320	230	1110	140
430	36	END	183

```
1 GOTO2000
7 '
8 'FREQUENT SUBROUTINES
9 '
10 K$=INKEY$:IFK$=""THENGOTO10EL
SEK=VAL(K$):RETURN
12 FORSS=1TO2:SOUND220,1:NEXTSS:
RETURN
13 FORSS=1TO9:SOUND220,1:NEXTSS:
RETURN
15 PRINTTAB(1)STRING$(30," "):PR
INTTAB(1)STRING$(30," ");:RETURN
20 PRINTTAB(1)STRING$(30,CHR$(14
0));:RETURN
25 PRINTTAB(1)STRING$(30,CHR$(13
1));:RETURN
30 IFLE=0 THENPRINT@163,"enter"B
B$;"expense"BB$"items";:SOUND200
,1:RETURN
31 PP=64:PX=PP:IX=1:FORX=I(1) TO
(I(1)+6):PRINT@PP+0,STRING$(32,C
HR$(143));
35 IFX<(EN+1) THENPX=PP:PRINT@PP
+0,IX$(IX);:PX=PX+1:PRINT@PX,USI
NG"%    %";ED$(X);:PX=PX+7:FORY=
1TO3:IFEA(X,Y)<>0 THENPRINT@PX,U
SING N2$;EA(X,Y);:PX=PX+8:NEXTY:
 ELSEPX=PX+8:NEXTY
40 I(IX)=X:IX=IX+1:PP=PP+32:NEXT
X:SOUND200,1:RETURN
45 IFLI=0 THENPRINT@163,"enter"B
B$;"income"BB$"items";:SOUND200,
1:RETURN
46 PP=64:PX=PP:IX=1:FORX=I(1) TO
(I(1)+6):PRINT@PP+0,STRING$(32,C
HR$(143));
50 IFX<(IN+1) THENPX=PP:PRINT@PP
+0,IX$(IX);:PX=PX+1:PRINT@PX,USI
NG"%    %";ID$(X);:PX=PX+7:FORY=
1TO3:IFIA(X,Y)<>0 THENPRINT@PX,U
SING N2$;IA(X,Y);:PX=PX+8:NEXTY:
 ELSEPX=PX+8:NEXTY
55 I(IX)=X:IX=IX+1:PP=PP+32:NEXT
X:SOUND200,1:RETURN
60 FORX=1TO3:TE(X)=0:FORY=1TOLE:
TE(X)=TE(X)+EA(Y,X):NEXTY,X:FORX
=1TO3:TI(X)=0:FORY=1TOLI:TI(X)=T
I(X)+IA(Y,X):NEXTY,X:FORX=1TO3:P
B(X)=TI(X)-TE(X):NEXTX
65 PRINT@288,CHR$(140);:GOSUB20:
PRINT@320,"expense";:PP=320:FORX
=1TO3:PP=PP+8:PRINT@PP,USINGN2$;
TE(X);:NEXTX
70 PRINT@352,"income";BB$;:PP=35
2:FORX=1TO3:PP=PP+8:PRINT@PP,USI
NGN2$;TI(X);:NEXTX
75 PRINT@384,"balance";:PP=384:F
ORX=1TO3:PP=PP+8:PRINT@PP,USING
N2$;PB(X);:NEXTX
80 PRINT@416,CHR$(131);:GOSUB25:
RETURN
```

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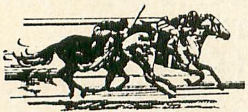

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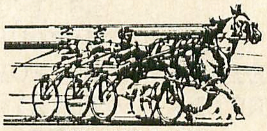

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```
97 '
98 'OTHER SUBROUTINES
99 '
100 PRINT@448,"";:GOSUB15:PRINT@
449,"";:GOSUB12:LINEINPUT"DESC:
";XX$:IFXX$="" THENSOUND1,1:GOTO
100ELSEPRINT@132,"*** "XX$" ***"
;
102 PRINT@448,"";:GOSUB15:PRINT@
449,"AUTO AMOUNT";:GOSUB12:INPUT
XX
105 IFIE$="E" THENED$(I)=XX$:DE(
I)=XX:IFEA(I,1)=0 ANDEA(I,2)=0 A
NDEA(I,3)=0 THENFORX=1TO3:EA(I,X
)=DE(I):NEXTX:RETURN:ELSERETURN
110 ID$(I)=XX$:DI(I)=XX:IFIA(I,1
)=0 ANDIA(I,2)=0 ANDIA(I,3)=0 TH
ENFORX=1TO3:IA(I,X)=DI(I):NEXTX:
RETURN:ELSERETURN
120 IFI=LE THENED$(I)="":DE(I)=0
:FORZ=1TO3:EA(I,Z)=0:NEXTZ:LE=LE
-1: ELSEFORX=I TOLE-1:IFED$(X+1)
<>"" THENED$(X)=ED$(X+1):ED$(X+1
)="":DE(X)=DE(X+1):DE(X+1)=0:FOR
Z=1TO3:EA(X,Z)=EA(X+1,Z):EA(X+1,
Z)=0:NEXTZ:NEXTX:LE=LE-1: ELSENE
XTX
125 RETURN
130 IFI=LI THENID$(I)="":DI(I)=0
:FORZ=1 TO3:IA(I,Z)=0:NEXTZ:LI=L
I-1: ELSEFORX=I TOLI-1:IFID$(X+1
)<>"" THENID$(X)=ID$(X+1):ID$(X+
1)="":DI(X)=DI(X+1):DI(X+1)=0:FO
RZ=1TO3:IA(X,Z)=IA(X+1,Z):IA(X+1
,Z)=0:NEXTZ:NEXTX:LI=LI-1: ELSEN
EXTX
135 RETURN
140 PRINT@448,"";:GOSUB15:PRINT@
449,"PERIOD"K"AMOUNT";:GOSUB12:I
NPUTXX:IFIE$="E" THENEA(I,K)=XX
ELSEIA(I,K)=XX
145 RETURN
150 CLS:PRINT"";:IFIE$="E" THENP
RINTSTRING$(32,CHR$(242)); ELSEP
RINTSTRING$(32,CHR$(162));
155 PRINT@16,"display";BB$;:PRIN
T@32,BB$;"period>";:PRINT@42,USI
NGN3$;PD$(1);:PRINT@50,USINGN3$;
PD$(2);:PRINT@58,USINGN3$;PD$(3)
;:IFIE$="E" THEN160 ELSE165
160 PRINT@7,BB$;"expense";BB$;:P
RINT@449,"a-h  nEW EXPENSE  iNCO
ME  sAVE";:PRINT@481,"  <ARROWS>
  oPEN NEW PERIOD";:RETURN
165 PRINT@8,BB$;"income";BB$;:PR
INT@449,"a-h  nEW INCOME  ExPENS
E  sAVE";:PRINT@481,"  <ARROWS>
 oPEN NEW PERIOD";:RETURN
170 CLS:PRINT@193,"    PERIOD
     AMOUNT  ";:PRINT@227,STRING
$(10,CHR$(131));:PRINT@242,STRIN
G$(8,CHR$(131));:PRINT@385,"AUTO
 AMOUNT:";:PRINT@416,"";:GOSUB25
175 PRINT@32,"";:GOSUB20:PRINT:I
FIE$="E" THENPRINTTAB(5)"EXPENSE
 ITEM UPDATE":ELSEPRINTTAB(5)"IN
COME ITEM UPDATE"
180 GOSUB25:RETURN
185 PRINT@449,"";:GOSUB15:PRINT@
449,"   UPDATE PERIOD <1> <2> <3
>    dESC *DELETE  nEW ITEM  rET
URN";:RETURN
190 PRINT@449,"";:GOSUB15:PRINT@
449," file full - press enter";:
GOSUB10:RETURN
297 '
298 'EXPENSE ITEM UPDATE
299 '
300 IE$="E":I(1)=1
305 PP=32:GOSUB150:GOSUB60:GOSUB
30
310 I=0:GOSUB10
315 IFK$=CHR$(10) THENI(1)=I(1)+
6:IFI(1)>LE THENI(1)=LE:GOSUB30:
GOTO310:ELSEGOSUB30:GOTO310
320 IFK$="^" THENI(1)=I(1)-6:IF
I(1)<1THEN I(1)=1:GOSUB30:GOTO31
0 ELSEGOSUB30:GOTO310
325 IFK$="N" THENGOSUB400:GOTO30
5:ELSEIFK$="I" THEN500 ELSEIFK$=
"S" THENIO=2:GOSUB800:GOTO300 EL
SEIFK$="O" THENGOSUB700:GOTO300
330 FORX=1TO8:IFK$=I$(X) THENI=I
(X):NEXTX:ELSENEXTX
335 IFI=0 THEN340 ELSEIFI>ENTRIE
S THEN340 ELSEIFED$(I)="" THEN34
0 ELSEGOSUB400:GOTO305
340 SOUND1,1:GOTO310
397 '
398 'EXPENSE ITEM UPDATE
399 '
400 SOUND200,1
405 IFK$="N" THENLE=LE+1:I=LE:IF
LE>EN THENLE=EN:GOSUB190:RETURN
410 GOSUB170:PRINT@132,"*** "ED$
(I)" ***";:PP=259:FORX=1TO3:PRIN
T@PP,X;:PRINT@PP+2,">";:PRINT@PP
+4,USINGN3$;PD$(X);:PRINT@PP+15,
USING N2$;EA(I,X);:PP=PP+32:NEXT
X:PRINT@402,USINGN2$;DE(I);
415 IFK$="N" THENGOSUB100:K$="":
GOTO410: ELSEGOSUB185
420 GOSUB10:IFK$="R" THENRETURN
ELSEIFK$="*" THENGOSUB120:RETURN
:ELSEIFK$="D" THENGOSUB100:GOTO4
00ELSEIFK$="N" THENGOTO400
```

```
425 IF K>0 AND K<4 THENGOSUB140:
GOTO410
430 SOUND1,1:GOTO420
497 '
498 'INCOME DISPLAY
499 '
500 IE$="I":I(1)=1
505 PP=32:GOSUB150:GOSUB60:GOSUB
45
510 I=0:GOSUB10
515 IFK$=CHR$(10) THENI(1)=I(1)+
6:IFI(1)>LI THENI(1)=LI:GOSUB45:
GOTO510:ELSEGOSUB45:GOTO510
520 IFK$="^" THENI(1)=I(1)-6:IF
I(1)<1THEN I(1)=1:GOSUB45:GOTO51
0ELSEGOSUB45:GOTO510
525 IFK$="N" THENGOSUB600:GOTO50
0:ELSEIFK$="X" THEN300 ELSEIFK$=
"S" THENIO=2:GOSUB800:GOTO300 EL
SEIFK$="O" THENGOSUB700:GOTO500
530 FORX=1TO8:IFK$=I$(X) THENI=I
(X):NEXTX:ELSENEXTX
535 IFI=0 THEN540 ELSEIFI>9 THEN
540 ELSEIFID$(I)="" THEN540 ELSE
GOSUB600:GOTO505
540 SOUND1,1:GOTO510
597 '
598 'INCOME ITEM UPDATE
599 '
600 SOUND200,1
605 IFK$="N" THENLI=LI+1:I=LI:IF
LI>IN THENLI=IN:GOSUB190:RETURN
610 GOSUB170:PRINT@132,"*** "ID$
(I)" ***";:PP=259:FORX=1TO3:PRIN
T@PP,X;:PRINT@PP+2,">";:PRINT@PP
+5,USINGN3$;PD$(X);:PRINT@PP+15,
USING N2$;IA(I,X);:PP=PP+32:NEXT
X:PRINT@402,USINGN2$;DI(I);
615 IFK$="N" THENGOSUB100:K$="":
GOTO610: ELSEGOSUB185
620 GOSUB10:IFK$="R" THENRETURN
ELSEIFK$="*" THENGOSUB130:RETURN
:ELSEIFK$="D" THENGOSUB100:GOTO6
00ELSEIFK$="N" THENGOTO600
625 IF K>0 AND K<4 THENGOSUB140:
GOTO610
630 SOUND1,1:GOTO620
697 '
698 'OPEN NEW PERIOD
699 '
700 CLS:SOUND200,1
705 PRINT@129,STRING$(30,CHR$(14
0)):PRINTTAB(3)"SHIFT AND OPEN N
EW PERIOD":PRINT TAB(1)STRING$(3
0,CHR$(131))
710 GOSUB12:PRINT@292,"HIT ANY K
```

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```
EY TO CONTINUE               OR r
ETURN";:GOSUB10:IF K$="R" THENRE
TURN
715 PRINT@288,"":GOSUB15,:PRINT@
289,"ENTER NEW PERIOD DATE (MM/D
D)";:PRINT@335,"";:GOSUB12:LINEI
NPUT"";XX$:PRINT@288,"";:GOSUB15
:PRINT@294,"NEW PERIOD FOR ";XX$
:PRINTTAB(6)" NOW BEING OPENED";
720 FORX=1TOLE:EA(X,1)=EA(X,2):E
A(X,2)=EA(X,3):EA(X,3)=DE(X):NEX
TX:FORX=1TOLI:IA(X,1)=IA(X,2):IA
(X,2)=IA(X,3):IA(X,3)=DI(X):NEXT
X:PD$(1)=PD$(2):PD$(2)=PD$(3):PD
$(3)=XX$:RETURN
797 '
798 'I/O ROUTINES
799 '
800 CLS:SOUND200,1
805 IFIO=1 THENIO$="LOAD" ELSEIO
$="SAVE"
810 PRINT@64,"";:GOSUB20:PRINT@1
05,IO$;" FILE";:PRINT@128,"";:GO
SUB25
815 GOSUB13:PRINT@193,"POSITION
TAPE...":PRINT" READY CASSETTE..
.":PRINT" PRESS ANY KEY TO CONTI
NUE":GOSUB10:PRINT@192,"":GOSUB1
5:GOSUB15:IFIO=2 THEN845
820 '*---LOAD FILE---*
825 SOUND220,1:PRINT@193," LOADI
NG BUDGET FILE";
830 OPEN"I",#-1,"BUDGET":SOUND22
0,1
835 INPUT#-1,LE,LI:FORX=1TOLE:IN
PUT#-1,ED$(X),DE(X):FORY=1TO3:IN
PUT#-1,EA(X,Y):NEXTY,X:FORX=1TOL
I:INPUT#-1,ID$(X),DI(X):FORY=1TO
3:INPUT#-1,IA(X,Y):NEXTY,X:FORX=
1TO3:INPUT#-1,PD$(X):NEXTX
840 CLOSE#-1:RETURN
845 SOUND220,1
850 PRINT@193," SAVING BUDGET FI
LE";:MOTORON:FORX=1TO600:NEXTX
855 OPEN "O",#-1,"BUDGET":SOUND2
20,1
860 PRINT#-1,LE,LI:FORX=1TOLE:PR
INT#-1,ED$(X),DE(X):FORY=1TO3:PR
INT#-1,EA(X,Y):NEXTY,X:FORX=1TOL
I:PRINT#-1,ID$(X),DI(X):FORY=1TO
3:PRINT#-1,IA(X,Y):NEXTY,X:FORX=
1TO3:PRINT#-1,PD$(X):NEXTX
865 CLOSE#-1:RETURN
897 '
898 'CREATE NEW FILE
899 '
900 CLS:SOUND200,1
905 PRINT@33,"":GOSUB20:PRINT:PR
INTTAB(6)"ENTER PERIOD DATES":GO
SUB25
910 PP=360:FORX=1TO3:PRINT@214,"
";:GOSUB15:PRINT@161,"PERIOD #";
X;:PRINT@227,"";:GOSUB12:LINEINP
UT"ENTER DATE (MM/DD): ";PD$(X):
PRINT@PP,"PERIOD ";X"--> ";:PRIN
TUSINGN3$;PD$(X):PP=PP+32:NEXTX:
GOTO500
997 '
998 'INITIALIZE PROGRAM
999 '
1000 CLEAR500:SOUND200,1:EN=25:I
N=5:DIMED$(EN):DIMEA(EN,3):DIMPD
$(3):DIMIA(IN,3):DIMI$(8):DIMI(8
):DIMDE(EN):DIMID$(IN):DIMDI(IN)
:DIMIX$(8):DIMTE(3):DIMTI(3):DIM
PB(3)
1005 LE=0:LI=0:FORX=1TO8:READIX$
(X),I$(X),I(X):NEXTX
1010 DATA a,A,1,b,B,2,c,C,3,d,D,
4,e,E,5,f,F,6,g,G,7,h,H,8
1015 N0$="##":N2$="####.##-":N1$
="+####.##":LD$="%  %":N3$="%
%":BB$=CHR$(128)
1030 '
1100 SOUND200,1
1105 CLS:PRINT@99,"home";BB$;"bu
dget";BB$;"analysis":PRINT:PRINT
"    BY: GLEN DUFUR":PRINT"     C
OPYRIGHT (C) 1985"
1110 PRINT:PRINTTAB(4)"lOAD EXIS
TING BUDGET FILE":PRINT:PRINTTAB
(4)"cREATE NEW BUDGET FILE":PRIN
T@424,"SELECT OPTION";
1115 IFXX$=CHR$(161) THENXX$=CHR
$(162):XY$=CHR$(164):XZ$=CHR$(16
6): ELSEXX$=CHR$(161):XY$=CHR$(1
68):XZ$=CHR$(169)
1120 PRINT@65,CHR$(138);:PRINTST
RING$(22,XX$);CHR$(133);:PRINT@1
29,CHR$(138);STRING$(22,XY$);CHR
$(133);:K$=INKEY$:PRINT@97,CHR$(
138);XZ$;:PRINT@119,XZ$;CHR$(133
)
1125 PRINT@438," ";:IFK$="" THEN
1115 ELSEIFK$="L" THENIO=1:GOSUB
800:GOTO500: ELSEIFK$="C" THEN90
0
1130 PRINT@438,K$;:SOUND1,5:GOTO
1115
1200 'CSAVE "BUDGET" ROUTINE
1205 FORX=1TO2:MOTORON:FORY=1TO6
00:NEXTY:MOTOROFF:CSAVE"BUDGET":
NEXTX:FORX=1TO5:SOUND200,1:NEXT:
END
1999 'PCLEAR ROUTINE
2000 PCLEAR1:GOTO1000
```

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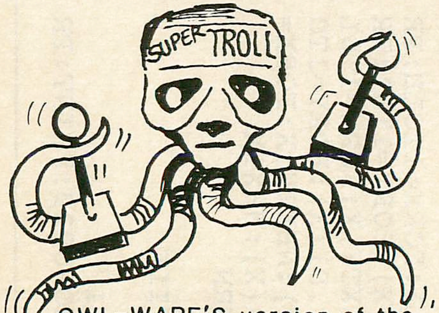

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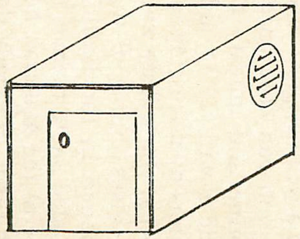

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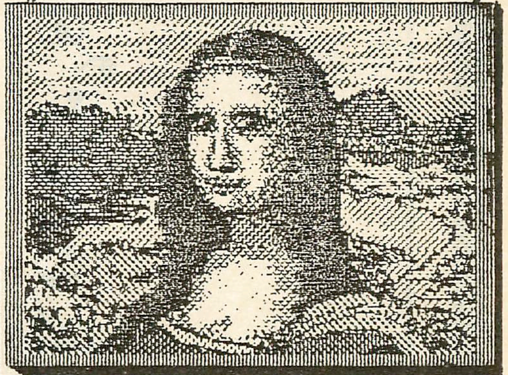

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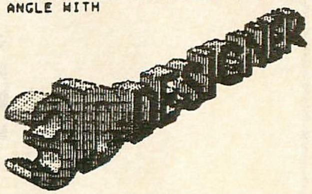

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A Disk Tinkerer's Device

By Martin H. Goodman

There was an excellent article in the December 1985 RAINBOW, "Zapping with Confidence," Page 118 by Jeffry Dwight, that provided a well-designed "disk zap" utility. Now you can have an easy means to examine and modify disks. In this article I will try to aid such hardy tinkerers by discussing some aspects of just what you will see when you look at your disks. Some of this material is explained in the Radio Shack Disk Extended BASIC manual in Chapter 11. Some of the material, however, is not given there, especially the information on specific file structure.

As a bonus, I'll provide you with a utility. Called *Analyzer*, it automatically gathers up the widely separated information on just where given directory files are on your disk and prints it out in a neat fashion. *Analyzer* can be used in conjunction with any disk editor, such as the one mentioned above.

Note 1: There may be some confusion about what number (zero or one) is the first number in a given sequence. The first sector on a track is numbered one, yet the first track on the disk is numbered zero. The first byte in the directory entry is called "byte zero." The first granule is called granule number zero. These are arbitrary conventions. They are not all consistent with each other, and are a pain to remember . . . but remember them a hacker must!

Note 2: When referring to the data on the disk, I'll denote it in two different forms. When I say the first 11 bytes contain the filename and extension, I mean that the data is there in ASCII code. However, when I say the File Type flag byte will be 0, 1, 2 or 3, I am indicating the Hex value of that byte. When I later refer to the value of a byte in the Granule Allocation Table, I'll also be referring to its Hex value.

The letter 'A' in ASCII is represented as Hex 41. Most disk zappers offer the option of displaying a sector in either Hex or ASCII. The one published in the December RAINBOW had even more options (decimal and binary) for how to display the data from the disk. The best disk zappers use a technique to display at the same time both the ASCII value and the Hex value of at least a selected byte in the sector, if not some or all of the sector. Some disk zappers (*VIPs*, for example) display "screen code" values of the sector. This is vaguely like an ASCII display, but the data is represented somewhat differently. With such zappers, the ASCII/Hex options need to be used. In this article, when I make reference to text I'm talking ASCII, but when I specify to numeric information I am talking Hex.

Note 3: I will assume we are considering only normal Radio Shack/Microsoft Disk Extended BASIC files here. What follows is not relevant directly to OS-9, copy-protected material or to noncopy-protected, but also non standard format disks, such as some new Radio Shack games, the new Infocom games and *Graphicom* or *WEFAX* picture disks.

Note 4: I will assume you are familiar with the fundamental divisions of data on a disk: the 35 tracks and the 18 256-byte sectors that are standard for Radio Shack's Disk Operating System. The Radio Shack Disk Extended BASIC manual is quite clear on this matter. I will also assume you understand that a "granule" consists of nine sectors on the disk, thus is 2¼K in size and can occupy either the first or the last nine sectors (numbered 1 through 9 or 10 through 18) on a given track. Every track except Track 17 (the directory track) consists of two granules. The directory track is excluded from granule notation. Therefore, Track 0, Sector 1 is the first sector in granule number 0, Track 16, Sector 18 is the last sector in Granule 33 and Track 18, Sector 1 is in Granule 34.

Note 5: Most of the time I will use Hex notation, but sometimes I will use decimal. Thus, when I refer to Track 17, I am talking decimal. Whenever I use Hex, I'll specify it by writing the word "Hex" or by preceding the number with a dollar sign ($).

Martin H. Goodman, M.D., a physician trained in anesthesiology, is a long time electronics tinkerer and outspoken commentator on CompuServe and Delphi (sort of the Howard Cosell of the CoCo Community). Among his numerous hardware and software design, production and marketing projects, he introduced Graphicom *and* WEFAX *to the CoCo world. His non-computer passions include running, mountaineering and outdoor photography. Marty lives in San Pablo, California.*

These notes may seem tedious, but hopefully they will help the novice get past some of the conventions that longtime hackers often accept and understand without thinking about them, yet are sometimes confusing to the newcomer.

Directory Structure

When you type `DIR`, you see a listing of filenames, extensions and then a number, a letter and another number. The first number displayed is the File Type, the letter is the ASCII flag and the last number is the number of granules in that file. Everything except for the information on how many granules there are in the file is directly recorded in the directory entry.

The directory starts on Track 17 (Hex $11), Sector 3. Each entry is 32 (Hex $20) bytes long, of which only the first 16 (Hex $10) bytes are used. The remaining 16 bytes are "reserved for future use" by Microsoft. Therefore, one sector can hold up to eight directory entries. If the directory has more than eight files on it, then more sectors (Track 17, sectors 4, 5, 6, etc.) are used. Let's look at Track 17, Sector 3.

Bytes $00 through $0A: Filename and Extension

As can be learned from reading Chapter 11 of the Radio Shack manual, filenames in the directory are placed on Track 17, Sector 3 and up. The first eight bytes of the entry are the filename, the next three are its extension. These 11 bytes normally contain ASCII characters. Files that were killed will have the first byte in their name changed to Hex 0.

Byte $0B: File Type Flag

The next one is the File Type flag. This byte equals 00 for tokenized BASIC programs. It equals Hex 01 for what the Radio Shack manual calls "BASIC data files," or what you will encounter as "ASCII BASIC" files, or as with many word processors and editor/assemblers, ASCII text files. It equals Hex 02 for machine language programs. The manual says this byte equals Hex 03 for "text editor source files." This File Type is rarely encountered, except by users of *Color Scripsit*. To those, I suggest buying *Telewriter* and *Telepatch* or *VIP Writer* or *Elite Word*. You'll have a much better word processor and won't have to worry about text editor source files.

Byte $0C: ASCII Flag

The ASCII flag follows the File Type flag. This single byte is set to zero if the file is in binary format, and set to Hex FF if the file is in ASCII format. Tokenized BASIC is a kind of binary File Type; so is a machine language program. Thus, both of those tend to have the ASCII flag set to zero. ASCII text files (File Type flag = 1) have their ASCII flag set to Hex FF.

Sample Run

```
* INDICATES A KILLED FILE WHEN IN FRONT OF FILE NAME
* INDICATES INVALID GAT ENTRY IN GAT LISTING
KILLED FILES THAT ARE NOT LISTED AS 'SCRUNCHED GAT' HAVE MOST LIKELY
BEEN WRITTEN OVER BY A NEW FILE AND ARE REALLY LOST!


DIRECT1 /BAK BASIC data file    ASCII
00,01,02,03,04,05,06
 2  = # OF SECTORS  IN LAST GRAN
2 = # OF BYTES IN LAST SECTOR

DIRECT2 /BAK BASIC data file    ASCII
07,08,09,0A
 6  = # OF SECTORS  IN LAST GRAN
3B = # OF BYTES IN LAST SECTOR

DISKANAL/BAK BASIC program      BINARY
0B
 9  = # OF SECTORS  IN LAST GRAN
FF = # OF BYTES IN LAST SECTOR

DIRECT1 /TXT BASIC data file    ASCII
0C,0D,0E,0F,10,11,12
 2  = # OF SECTORS  IN LAST GRAN
2 = # OF BYTES IN LAST SECTOR

DIRECT2 /TXT BASIC data file    ASCII
13,14,15,16
 6  = # OF SECTORS  IN LAST GRAN
3B = # OF BYTES IN LAST SECTOR

DISKANAL/BAS BASIC program      BINARY
17
 9  = # OF SECTORS  IN LAST GRAN
FF = # OF BYTES IN LAST SECTOR
```

Byte $0D: First Granule

This is the number of the first granule used for the file.

Bytes $0E and $0F: Number of Bytes in Last Sector

Byte $0E is the high order byte, and is either zero or one — most of the time it is zero. If one, the next byte is zero, and 256 bytes in use (a full sector) are specified. Byte 15 varies from one through FF to signify from one through 255 bytes used in the last sector of the file. Bytes $10 through $1F are "reserved" from back in 1981 for "future use." They have never been used.

Note here that while bytes Hex 0D,0E and 0F provide some information about where the file resides on the disk and how far it extends, they leave out a lot! They give no clue, in and of themselves, as to how many granules there are in the file or of how many sectors are used in the last granule of the file. To find that out, you have to move over to Track 17, Sector 2, called the Granule Allocation Table, or GAT.

The GAT

The GAT occupies Track 17, Sector 2. Actually, only the first 68 bytes of Track 17, Sector 2 constitute the GAT. The disk manual incorrectly states that the remaining bytes in that sector will be zero. Anyone who's ever looked at a disk with a zapper knows this is not true. Indeed, due to some sloppy code in Disk BASIC, copies of pieces of the directory itself wind up in the space beyond the 68th byte of Track 17, Sector 2. This little idiosyncrasy had to be corrected by authors of Disk BASIC modifications who were implementing support for 40- and 80-track drives, but that's another story. Suffice it to say here that in a normal Disk BASIC disk, the first 68 bytes of Track 17, Sector 2 are the GAT and the remaining bytes are "garbage."

The first byte in the GAT is "byte number zero." Each byte in the GAT corresponds to the status of a given granule on the disk. That status is encoded as follows: If the GAT byte is equal to $FF, then the corresponding granule is avilable for new files. On a blank disk this is a blank (all $FF) granule; on an often-used disk, which has had files killed and other files written to it, that granule might contain some data from a previously killed file.

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In either case, the granule is flagged as available for new files.

If a byte in the GAT is equal to a number from zero through 67 ($0 through $43), it means that the granule is occupied by a given directory file, that this granule is *not* the last granule in the file, and the next granule in the file is the granule number corresponding to the number in that byte. As a result, if the directory entry says the first granule in a file is Granule $1E and Byte $1E in the GAT reads Hex 1F, that means granule $1F is the next granule in the file, and Byte $1F of the GAT must now be looked at to learn more about where the file resides.

If the byte in the GAT reads $C1 through $C9, it means the corresponding granule is the last granule in the file, and the number of sectors in the granule that actually belong to the file is the low order Hex digit of the number in the GAT byte. That is, if we look at Byte $1F from the example of the last paragraph and find it contains $C4, it means the file in question occupies a total of two granules, granules 1E and 1F, and Granule 1F actually has only the first four of its sectors used for the file (the remaining five would be wasted).

Note that the smallest file in Disk BASIC *must* occupy a whole granule, even if it is only one byte long. The rest of the granule in question is wasted. Note that if a GAT byte is equal to any number *besides* $FF, 00 through $43, or $C1 through $C9, it means the GAT itself has an error in it! The Disk BASIC manual alleges that $C0 is a valid code for a GAT byte, but I can see no use for that value. (If a reader can explain to me the significance of a $C0 GAT byte value, I'd appreciate it.) For now, I can only assume the Disk BASIC manual is in error on this matter.

To fully know exactly where the file ends, we now need to hop back to look at the directory entry for the number of bytes in the last sector of the file that are actually used. You now can see that the specification of what bytes on the disk corrrespond to a given file is smeared out between the directory entry for that file and the GAT. In the GAT, the file size has to be determined by tracking down the file from GAT byte to GAT byte, until the end of what programmers call the "linked list" of bytes is reached. And finally, after finding the last granule and last sector in that granule, one has to go back to the directory entry to find where the last used byte is in the last sector.

What a mess! Why did they do it that way? Despite the mess, there is some method to this madness. Grouping all the information concerning which granules are used and which are not into one single block, they facilitate keeping track of available space on the disk and make killing of old files easier to do. Though there are some ways in which the scheme is needlessly complex, it actually makes more sense than it seems to upon first glance after you start considering how disk operating systems and file managers have to be written.

Killed Files

When you kill a file using Disk BASIC, the actual file data is not immediately destroyed. What happens is the first byte in the name of the file in the directory is set to zero, and all bytes in the Granule Allocation Table, which correspond to bytes in that file, are set to $FF (= available). Thus, if you kill a file, all data in the file remains on the disk. Only the information in the GAT needed to find such data is destroyed by the `KILL` command itself.

> "The best disk zappers use a technique to display at the same time both the ASCII value and the Hex value of at least a selected byte in the sector."

Of course, if you try to `SAVE` any new data to a disk after killing a file, you may end up writing over granules that were previously a part of the killed file, or even writing over the old killed directory entry as well. At that point, the file data in the killed file is completely destroyed. But, if you have merely killed a file and then want to restore it, such restoration is possible, though often tedious.

As you add files to a fresh, formatted disk, Disk BASIC is inclined to assign granules to each new file in a fashion that starts on one side of the dirctory and tends to alternate on either side of the directory track. Therefore, files under Disk BASIC tend to get assigned near the middle of the disk and grow towards both the center and the outer edge.

However, some disk utilities (such as Spectrum Projects' *Directory Utiltity*) assign granules sequentially from Granule 0 to Granule 68; disks that have had many files written to them, then erased, then others written to them, tend to have the granules that compose a given file scattered all over the disk. This can make reconstruction of a big killed file on such a disk very difficult.

File Structure

Now that you know how to find a given file, from its first to last byte on the disk, I'll explain what you can expect to see in the three most commonly encountered Disk BASIC files.

ASCII

ASCII text files ("BASIC text files") are the easiest of all to understand. These files have the File Type flag set to one and the ASCII flag set to $FF. They are almost totally "raw" data — just byte after byte of information, usually (though not necessarily) ASCII text. The only thing special about them is the last byte in the file is Hex 1A (control Z). This is the flag that marks the end of an ASCII text file. Within the file the bytes are typically less than a Hex value of $80, but are not required to be so. Thus, the only special "structure" such a file has is that it will not have any $1A's in it until the last byte of the file.

Tokenized BASIC

Tokenized BASIC files are a kind of binary file. They have a File Type flag of zero and an ASCII flag of zero as well. Looking at them in ASCII, you will be able to recognize all the text that is in the BASIC program, but all BASIC key words are encoded ("tokenized") into one or two bytes. Line numbers do not appear as ASCII, but as two Hex bytes.

For example, the line `257 PRINT "ABC"` appears in the file as the following sequence of bytes: 00 (a line delimeter), 01 01 (the two-byte Hex value for 257 decimal) followed by Hex 80 (the BASIC token code for `PRINT`), then Hex 22 41 42 43 22, the ASCII codes for `"ABC"`. Because no BASIC token is set to 00, and 00 is a nul (not used to encode ASCII letters and symbols), you will never find inside the tokenized BASIC file more than two 00 bytes in a row.

However, at the end of the file, you will find three 00 bytes. This is BASIC's "end of file flag." If you are in the process of reconstructing a disk after losing the GAT on it (an utterly thankless task . . . let me tell you!), your reconstruction of a given BASIC file is aided by your search for the sector with BASIC code and three 00 bytes.

Occasionally, you might encounter what appears to be a normal BASIC file that has two sets of three 00 bytes in it. This most likely is an especially prepared "end packed" BASIC file, made up by programmers to stuff machine language code invisibly at the end of a BASIC file. Such files are not normal BASIC files and have been "foxed with" by the programmer.

Machine Language Files

These are by far the the most complicated files of all. This is due to the provision Microsoft made for "segmented" binary files. That is, an ML file on a disk (unlike its counterpart on a tape) can consist of several segments that load in different areas of memory. Let's start with the description of a non-segmented ML file, then go on from there.

Non-segmented ML Files

The `SAVEM` command generates non-segmented ML files. Note that the `SAVEM` command cannot generate a segmented ML file; those are created using various editor/assemblers or by foxing with the file as it resides on the disk using a disk zapper. Such non-segmented ML files (actually they are segmented files that have only one segment) begin with a 00 byte. This is followed by two bytes that specify number of ML data bytes, then by two more bytes that specify where the ML data is to start loading into memory. This five-byte "header" is followed by the ML data itself. At the end of the file is a five-byte ending sequence, consisting of an $FF byte, two bytes of 00 each, then two bytes that specify the execute address of the file.

For example, if you made a file using `SAVEM "TEST"` &H4321, &H4324, &H4322, and if $4321 through $4324 contain the Hex values A1, B2, C3 and D4 at the time you save the file, it appears on the disk (in Hex) as follows: 00 00 04 43 21 (the five-byte header with the 00 flag byte, the length of the file as $0004 and the start address of $4321), followed by A1, B2, C3, D4 (the actual data in the file itself), followed by the end five bytes of FF, 00, 00, 43 and 22.

Note carefully that the end address is not specifically stored as such on the disk in the file header. It must be calculated from the start of load address and the file length. Also note that you must track the file down to its end before you can tell what its execute address is.

Segmented ML Files

Segmented ML files are very similar, but after the first segment, instead of having an FF 00 00 (execute address) five-byte end flag, they have another header, specifying more data to be loaded elsewhere in memory. There is no limit (other than the memory of the CoCo and the size of the disk) on how many segments such a file can have, so it is possible to create an ML file that loads single bytes all over the memory of the CoCo. In these segmented files the end is recognized by the presence of the FF end flag followed by the 00 00 (execute address) five-byte final block. Thus, a segmented ML file can have lots of start and end addresses, though it can only have one execute address.

This segmented structure can be a bit

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confusing, but it is very convenient for assemblers! And, it is helpful when you need to make a program that loads stuff in differing and widely separated areas of memory. Such segmented files are easily created with *EDTASM* and with *Macro 80C* (and probably most other editor/assembler packages) using more than one `ORG` statement in the source code. Indeed, some assemblers that assemble directly to disk, like *Macro 80C*, create segmented files even when assembling source code that is not multiple `ORG`ed. In such cases, the end address of one segment will be seen to be one less than the start address of the next.

References

Disk BASIC Unravelled, published by Spectral Associates, is the bible for ML disk hackers. Indeed, I'd go so far as to say that if you do any assembly language hacking using Disk BASIC, you need to buy the three-volume *BASIC Unravelled* (cost is about $50). This set has fully commented disassemblies of all versions of the CoCo ROMs, gobs of information about the RAM-base page and such, stuff on file formats, BASIC routine entry points, and the like. It is what Microsoft and Tandy should have published the day they released the CoCo on the market. Spectral Associates and the unnamed ML hacker(s) who compiled this set deserve the thanks of all CoCo users.

The *Disk Extended BASIC Manual* comes with your Radio Shack disk Drive 0. This manual can be ordered separately, although only the few pages in Chapter 11 are of relevance to what is written here.

The Disk Analyzer Program

The following simple BASIC program automatically searches out all the information needed to find every byte in a given valid file on a Disk BASIC disk. It dumps that information to a printer; you can also have it go to the screen by changing Line 50 from D=-2 to D=0. If you do this, you'll want to add some kind of pause feature as the data otherwise scrolls by too quickly to read. Just load the program, type `RUN`, put the disk you want to analyze in Drive 0, make your printer ready and press any key. All text is printed in ASCII characters and all numeric values are printed in Hex.

Analyzer prints four lines of information about each file on your disk.

First line: Filename, extension, File Type flag byte status, ASCII flag status (an asterisk [*] precedes any killed files on your disk that this *Analyzer* will see and list).

Second line: The numbers of all the granules that compose the file, from the first to the last. If invalid granule numbers are detected, the program indicates this by a '*' and/or by printing in the next line "scrunched GAT!".

Third line: The number of sectors in the last granule.

Fourth line: The number of bytes in the last sector.

This program gathers together all the widely separated data into one table for you to refer to when you are wandering around your disk using a disk zapper. Note that *Analyzer* does some testing for messed up entries, but on a disk with blown directory entries it won't be of much use. ☐

300 95
470 48
920 72
END 163

The listing: `ANALYZER`

```
10 CLEAR 2000
20 DIM G(69)
25 CLS:PRINT"(C) MARTY GOODMAN 1
985":PRINT
30 PRINT"DIRECTORY ANALYZER":PRI
NT:PRINT"PREPARE PRINTER":PRINT:
PRINT"HIT ANY KEY TO CONTINUE"
40 IF INKEY$="" THEN GOTO 40
50 D=-2
70 PRINT#D,"* INDICATES A KILLED
 FILE WHEN IN FRONT OF FILE NAME
"
80 PRINT#D,"* INDICATES INVALID
GAT ENTRY IN GAT LISTING"
90 PRINT#D,"KILLED FILES THAT AR
E NOT LISTED AS 'SCRUNCHED GAT'
HAVE MOST LIKELY"
92 PRINT#D,"BEEN WRITTEN OVER BY
 A NEW FILE AND ARE REALLY LOST!
"
95 PRINT#D,"":PRINT#D,""
100 REM READ IN GAT
110 DSKI$ 0,17,2,A$,B$
120 FOR N=1 TO 68
130 G(N)=ASC(MID$(A$,N,1))
140 NEXT N
200 REM ANALYZE DIRECTORY
210 S=3
250 DSKI$ 0,17,S,A$,B$
300 REM MAIN LOOP
305 IF LEN(A$)=0 THEN :GOTO 5000
307 K=0
310 T=1:GOSUB 2000:IF E$=CHR$(&H
FF) THEN GOTO 9000
320 IF ASC(E$)<>0 THEN GOTO 350
325 K=1
335 PRINT#D,"* ";
350 T=8:GOSUB 1000:PRINT#D,E$;:P
RINT#D,"/";
360 T=3:GOSUB 1000:PRINT#D,E$;
370 T=1:GOSUB 1000
375 E=ASC(E$)
380 IF E=0 THEN GOTO 410
385 IF E=1 THEN GOTO 420
390 IF E=2 THEN GOTO 430
395 IF E=3 THEN GOTO 440
400 PRINT#D," BAD FLAG BYTE  ";:
GOTO 450
410 PRINT#D," BASIC program  ";:
GOTO 450
420 PRINT#D," BASIC data file";:
GOTO 450
430 PRINT#D," Mach Lang progm";:
GOTO 450
```

```
440 PRINT#D," Txt Ed src file";
450 PRINT#D,"     ";:T=1:GOSUB 100
0:E=ASC(E$)
460 IF E=0 THEN GOTO 480
465 IF E=255 THEN GOTO 490
470 PRINT#D," *BAD* ":GOTO 500
480 PRINT#D," BINARY":GOTO 500
490 PRINT#D," ASCII "
500 REM ANALYZE GAT ENTRIES
510 T=1:GOSUB 1000:E=ASC(E$)
515 COMMA=0
520 REM GAT LOOP
525 GOSUB 3000
530 IF V=0 THEN PRINT#D," *":GOT
O 890
540 IF V=2 THEN GOTO 800
545 IF COMMA=0 THEN GOTO 550
547 PRINT#D,",";
550 G$="0000":G$=G$+HEX$(E):G$=R
IGHT$(G$,2):PRINT#D,G$;
560 COMMA =1
570 E=G(E+1):GOTO 520
800 REM CHECK SECTORS USED IN
LAST GRAN
810 PRINT#D,"":PRINT#D,E AND &H0
F;" = # OF SECTORS  IN LAST GRAN
"
820 GOTO 900
890 PRINT#D,"SCRUNCHED GAT!"
900 REM CHECK BYTE COUNT IN LAST
 SECTOR AND LOOP
910 GOSUB 1000
915 B=ASC(E$):IF B>1 THEN GOTO 9
80
920 T=1:GOSUB 1000
925 BC=256*B+ASC(E$):IF BC>256 T
HEN GOTO 980
930 PRINT#D,HEX$(BC);" = # OF BY
TES IN LAST SECTOR"
940 T=16:GOSUB 1000
945 PRINT#D,""
950 GOTO 300
980 PRINT#D,"BAD BYTE COUNT ENTR
Y!":GOTO 940
1000 REM TRIM OFF LEFT AND GET
SUBSTRING
1005 E$=LEFT$(A$,T)
1010 A$=RIGHT$(A$,LEN(A$)-T):RET
URN
2000 REM GET LEFT STRING
2010 E$=LEFT$(A$,1):RETURN
3000 REM CHECK FOR VALID GAT ENT
RY
3005 V=1
3010 IF E<68 THEN RETURN
3020 IF E>&HBF GOTO 3040
3030 V=0:RETURN
3040 IF E>&HC9 THEN GOTO 3030
3050 V=2:RETURN
5000 REM CHECK FOR MORE DATA IN
B$ OR IN NEXT SECTOR
5010 IF B$<>"" THEN A$=B$:B$="":
GOTO 300
5020 S=S+1:GOTO 250
9000 REM ALL DONE
9010 SOUND 100,20:CLS:PRINT@270,
"DONE"
9020 END
10000 REM GAT DISPLAY
10010 PRINT#D,:PRINT#D,:PRINT#D,
" GRANULE ALLOCATION TABLE LIS
TING"
```

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VARLIST:

A Quick and Easy Way to List Program Variables

By Hans Schulz

Varlist, a utility program that lists all variables, will lend some help with those pesky problem programs that you just can't get to work properly.

Let's look at an example. I once had a program with a variable called LNC (for "Line Count"); it also had another variable named LND (for "Line Description"). The program just didn't work as anticipated. Of course, in hindsight I realized the error of my ways: Only the first two characters are significant in a variable name. The program treated LNC and LND as the same variable!

Now, if I only had a utility tool that could tell me all the lines containing LNC and LND. I didn't have such a tool, and it took me an agonizingly long time to go through every line of the program to change one of the variable names so it was different from the other.

I decided then that someday I would write such a utility program. *Varlist* is the result, and I would like to share it with other CoCo friends. It lists all the numbers of the lines in which variables appear; in fact, if a variable appears twice, it is listed twice. In addition, it also highlights all the jump statements, i.e., `GOTO`, `GOSUB`, `THEN` and `ELSE`.

Do You Like BASIC's Beauty?

This program is written entirely in BASIC. As you can imagine, it does not exactly race through the target program, but it lets you know where it is at all times. In the interest of preserving some processing speed, I have kept the `REM`arks to a bare minimum and have eliminated unnecessary spaces wherever possible. A program line without spaces between BASIC statements and variable names may look strange at first sight, but you will get the drift of it.

Are You in a Hurry?

`POKE 65495,0` will increase your processing speed, but if you are really impatient, insert lines 50001 and 50601 into *Varlist* for additional speed (see Listing 2). However, you lose the screen display during this speed up.

Do You have Enough Memory?

Varlist uses approximately 9,000 bytes (9K) of RAM. The program changes the standard `PCLEAR4` when you first turn on the CoCo to `PCLEAR1`, which only reserves one page of graphics memory (1,536 bytes). If you have a lengthy target program you may have to free up some additional memory to fit both *Varlist* and your program into the available RAM space. To get at the extra 1,536 bytes, you have to perform the equivalent of a `PCLEAR0`, which, as you may know, is not a valid BASIC command. It can be summarized as follows: When you first power up your CoCo, type `POKE &H19,6:NEW` and press ENTER. In this case, you should also remove the `PCLEAR1` statement from Line 50010.

How do You get the Program to Work?

First key in *Varlist* and `CSAVE` a copy of it, then make sure there are no typing errors by testing it with `RUN 50000`. It will list the variables in the test program (lines 10 through 90). Correct typing errors, if any, and `CSAVE` a corrected copy of *Varlist.* Now delete lines 10 through 90.

Make sure the program for which you want to produce the list of variables does not have any line numbers greater than 49999 and, if necessary, renumber it. Merge your program with *Varlist.* Now type `RUN 50000` and press ENTER. The screen will display the line numbers of your program, which *Varlist* is scrutinizing as it steps through the program line by line.

How does *Varlist* Work?

Line 50010 reserves 1,500 bytes of memory for string variables and reserves space for 500 variable names and 500 line numbers; it also releases three pages of graphics memory. (When you turn on your CoCo it automatically `PCLEAR`s four graphics pages.) Then the screen is cleared.

Line 50030 finds the starting address of your BASIC program in memory, regardless of whether you have a 16K or 32K CoCo. (This may be useful for future reference.)

Line 50040 initializes the variable PO (the pointer address of the beginning of the next line) and variable LI (the current line number being worked on). Line 50570, processed in the `GOSUB` statement, displays the line number being examined on the screen. If the line number is greater than 49999 then the program has reached *Varlist* and the end of your target program, in which

---

Hans Schulz works for a major Canadian bank in West Hill, Ontario. He is involved in planning the installation and upgrading of banking terminals in the bank's nationwide branch network.

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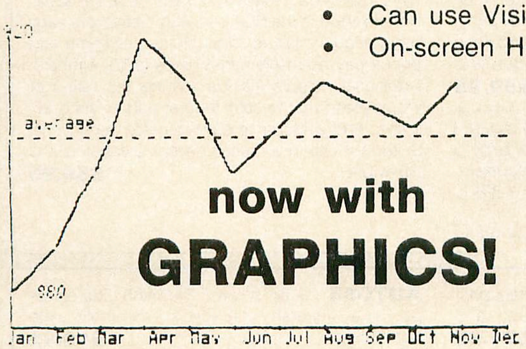

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Table 1
Sample Output:
Variables and Jumps in *Varlist*

```
50010  LA$(SUB)
50010  LR(SUB)
50030  N
50040  gosub 50550
50040  goto 50090
50060  gosub 50520
50070  C
50070  N
50070  N
50070  gosub 50550
50080  gosub 50520
50080  C
50080  then 50080
50090  N
50090  PO
50090  C
50090  PO
50090  N
50090  N
50090  goto 50070
50100  C
50100  N
50100  then 50080
50110  C
50110  N
50110  then 50080
50120  C
50120  N
50120  then 50080
50130  C
50130  N
50130  then 50080
50140  C
50140  N
50140  then 50080
50150  C
50150  C
50150  C
50150  C
50150  C
50150  thengosub 50540
50150  goto 50080
50160  C
50160  N
50160  D$
50160  D$
50160  gosub 50410
50160  goto 50090
50170  C
50170  N
50170  D$
50170  D$
50170  gosub 50410
50170  goto 50090
50180  C
50180  D$
50180  gosub 50410
50180  goto 50090
50190  C
50190  N
```

case all variables have been found and the list will be displayed on the screen starting at Line 50600.

As an aid to the general understanding of *Varlist*, I let it generate a list of the variables used in the *Varlist* program (see Sample Output, Table 1). I have also prepared a shortened list of the variables, where each variable appears only once, and have sorted the variables in alphabetical order (see Table 2).

The `GOSUB 50520` in Line 50060 reads the next character (in ASCII format) from the memory location where your program is stored.

Line 50070 is reused again later, and if 'C' (the character being examined) is a zero, it indicates that the last byte of the program line has been reached. In that case, 'N' (the number of the storage location being read) must be decremented by one to update the address pointer (PO) of the next line in the `GOSUB 50550`.

In Line 50080 the next character is read (`GOSUB 50520`). If the character ('C') is a space, then the process is repeated until a non-blank character is found.

If in Line 50090 the address pointer of the next line is identified, then PO is updated again.

Lines 50100 through 50140 identify some BASIC statements with two-byte tokens and processing continues with reading the next character in Line 50080. Line 50100 identifies a `PEEK`; Line 50110, a `USR` statement; Line 50120, an `ABS` function; Line 50130, an `ATN` function; and Line 50140, an `SQR` function.

Table 2
Short List of Variables
in Alphabetical Order

```
AA$
C
D$
I
I$
IM
IX
LA
LA$(SUB)
LI
LL
LR(SUB)
MN$
MX$
N
PL
PO
Q
R
S
T
Z
```

Line 50150 determines when processing can skip to the next line without reading to the end of the current line. That can be done when a `DATA` statement is encountered (token 134) or a `REM` (token 130), or its equivalent, the apostrophe ('), which is tokenized as 131, and also the `LLIST` statement (token 155) and `LIST` (token 148). `GOSUB 50540` accomplishes the skip to the next line, after which processing continues at 50080 by reading the next character.

Lines 50160 through 50200 are somewhat self-explanatory: They deal with the jump statements (`GOTO`, `GOSUB`, `THEN` and `ELSE`). Only Line 50190 seems a little out of place — it identifies the two-byte token for `RND` (255 132). The `RND` token is not of significance to the *Varlist* logic and the program reads the next character by branching back to 50080. Having disposed of the `RND` (255 132) token, it can now be deduced in Line 50200 that if the current character is a token 132, it is part of the two-byte token (58 132) representing the statement `ELSE`. (Does 58 seem familiar? It is the ASCII code for the colon [:], which is used by BASIC to separate statements on the same line. Quite clever, those Microsoft people, using the colon as part of the `ELSE` logic!)

Now, back to the jump statements. In each case a descriptor (D$) is being built. This string may contain, for example, the word "then" or "else" and may conceivably have the word "goto" or "gosub" added to it. At this point, a subroutine is performed (`GOSUB 50410`) that obtains the line reference number, i.e., the line number to which the jump statement has been programmed to jump. Upon return from the subroutine, with the next byte already read, processing branches back to 50090 to determine what to do with this character.

Line 50210 looks at the letter 'M' (ASCII code = 77). This is not an ordinary 'M' though, such as an 'M' that may be part of a variable name. It is the 'M' in `CLOADM`. The token for `CLOAD` is 151, and if the byte following it is the letter 'M', then `GOSUB 50520` reads it and, immediately afterwards, branches back to 50080 to read the next character. At this point Line 50220 discards any further tokenized BASIC statements, i.e., ASCII codes greater than 127, and branches back to 50080.

Line 50230 finds out if the character read is alphabetic, i.e., if the ASCII code is in the range from 65 to 90, representing the capital letters A to Z. Finally, the program does some real work after all the sifting and discarding up to this point: The subroutine at 50300 assembles the variable name, starting with the character ('C') just read, then adds to it, one byte at a time, until the variable name is completely assembled. After return from the subroutine, *Varlist* branches back again to 50080 to read the next character.

Line 50240 tests to see whether the character read is a quote ("), which is represented by ASCII code 34. Anything enclosed in quotes is of no interest in this program. Therefore, the subroutine at Line 50270 keeps on reading and discarding characters until it finds the second of a pair of quotes. The main body of this program ends at Line 50250, where processing loops back to read the next character at 50080.

What do the Subroutines do?

Varlist contains the following subroutines, which are each described here.

1) Skip between Quotes — Line 50260
2) Build the Variable Name — Line 50300
3) Build the Line Number Reference — Line 50400
4) Peek at the next ASCII Character — Line 50510
5) Skip to the next Line — Line 50530
6) Print the List of Variables — Line 50590

Skip between Quotes — Line 50260

As described earlier, this subroutine keeps reading and discarding characters until it finds the second of a pair of quotes (ASCII code 34). The subroutine also checks for reasonable length of the string between the pair of quotes. I felt anything in excess of five lines of 32 characters (a total of 160 characters) is probably in error and designed the program to stop in such a case. If this does not apply in your program, simply change Line 50280 accordingly.

Build the Variable Name — Line 50300

When powering up CoCo the subscript (LA) used to identify the labeled variable (LA$) has a value of zero. On each trip through the subroutine, that is, every time a new variable name is stored, the subscript is incremented by one in Line 50310. In Line 50320 the first character of the variable is stored; in 50330 the next character is read.

In Line 50340 the character value of zero indicates the end of the current line has been reached and it is now time to store the current line number (LI) in the array LR(LA). This array is used for later printing to indicate where each variable appears in the target program. The program then branches back to the beginning of the main routine of the program.

Line 50350 tests to see if the byte currently under scrutiny is numeric (ASCII codes 48 to 57) or if it is alphabetic (ASCII codes 65 to 90). If it is alphanumeric, the byte is appended to the array LA$(LA) and processing loops back within the subroutine to 50330 to read the next byte. If the character being examined in Line 50360 is a '$' sign (ASCII code = 36), it is added to the variable name and processing resumes at 50330, getting the next byte.

In Line 50370, if the character is an ASCII code 40, i.e., the opening bracket '(', then the literal "(SUB)" is appended to the variable name to show that the variable is subscripted. In other words, the variable is an array.

Line 50380 stores the current line number being worked on (and presently being held in "LI") in the Line Reference array, "LR(LA)."

Build the Line Number Reference — Line 50400

In Line 50410, which is similar to Line 50310, the subscript LA is incremented by one to store the Line Reference on each pass through the subroutine.

In Line 50420 the line number LI presently being processed is stored in the Line Reference array, "LR(LA)."

Line 50430 obtains the next character, and if it happens to be a blank (ASCII = 32), the program immediately gets the next byte.

(Mr. Schulz may be contacted with questions about his program at 50 Morna Avenue, West Hill, Ontario, Canada M1E 2B1, phone 416-281-1583. When writing, please include an SASE.) ☐

```
50040 ....151
50410 ....140
50380 .....99
50620 ....167
50790 ....166
51020 .....15
END ......89
```

Listing 1: VARLIST

```
10 REM**LINES 10-90 REPRESENT A
TEST PROGRAM FOR DEMONSTRATION.
15 FORO=1TOP:IFQ=RT THENGOSUB123
456789ELSE10
20 S3=T3+U:V(W)=X3
25 NEXT Y:  REM Q$
30 IFZ=5 THEN10ELSEGOTO13498
35 A3(56)=1:B345=2:C4444=3
40 IF PEEK(DT)=4 THEN POKE ER,1
45 '!!!
50 IFF=3THENG=9ELSEGOTO10
55 IF H=I THENGOSUB10:GOTO 10 'R
EAD & END
60 PRINT "A=";J;"    A3=";K3;"
";L(M);"=ARRAY R":RETURN
65 READ N$:END
70 DATA A,A3,B
90 LIST
50000 '*************************
      *         VARLIST         *
      *(LIST OF ALL VARIABLES)*
      *FOR THE COLOR COMPUTER *
      * BY HANS SCHULZ (1984) *
      *************************
50010 CLEAR1500:PCLEAR1:DIM LA$(
500),LR(500):CLS
50020 '***INITIALIZE***
50030 N=PEEK(25)*256+PEEK(26)-1
50040 GOSUB50550:GOTO50090
50050 '***READ THE FILE***
50060 GOSUB50520
50070 IFC=0THENN=N-1:GOSUB50550
```

```
50080 GOSUB50520:IFC=32THEN50080
50090 IFN=PO ANDC=0THENPO=PEEK(N
+1)+PEEK(N)*256:GOTO50070
50100 IF(C=134ANDPEEK(N-2)=255)T
HEN50080
50110 IF(C=131ANDPEEK(N-2)=255)T
HEN50080
50120 IF(C=130ANDPEEK(N-2)=255)T
HEN50080
50130 IF(C=148ANDPEEK(N-2)=255)T
HEN50080
50140 IF(C=155ANDPEEK(N-2)=255)T
HEN50080
50150 IFC=134ORC=130ORC=131ORC=1
55ORC=148THENGOSUB50540:GOTO5008
0
50160 IF(C=165ANDPEEK(N-2)=129)T
HEND$=D$+"goto":GOSUB50410:GOTO5
0090
50170 IF(C=166ANDPEEK(N-2)=129)T
HEND$=D$+"gosub":GOSUB50410:GOTO
50090
50180 IFC=167THEND$="then":GOSUB
50410:GOTO50090
50190 IF(C=132ANDPEEK(N-2)=255)T
HEN50080
50200 IFC=132THEND$="else":GOSUB
50410:GOTO50090
50210 IF(C=151ANDPEEK(N)=77)THEN
GOSUB50520:GOTO50080
50220 IFC>127THEN50080
50230 IF(C>64ANDC<91)THENGOSUB50
310:GOTO50080
50240 IFC=34THENGOSUB50270:Q=0:G
OTO50080
50250 GOTO50080
50260 '***SKIP BETWEEN QUOTES***
50270 GOSUB50520:Q=Q+1:IFC<>34TH
EN50270
50280 IFQ>160THENPRINT"CKECK FOR
 PAIRED QUOTES":STOP
50290 RETURN
50300 '*** GET VARIABLE NAME ***
50310 LA=LA+1
50320 LA$(LA)=CHR$(C)
50330 GOSUB50520
50340 IFC=0THENLR(LA)=LI:GOTO500
70
50350 IF(C>47ANDC<58)OR(C>64ANDC
<91)THENLA$(LA)=LA$(LA)+CHR$(C):
GOTO50330
50360 IFC=36THENLA$(LA)=LA$(LA)+
CHR$(C):GOTO50330
50370 IFC=40THENLA$(LA)=LA$(LA)+
"(SUB)"
50380 LR(LA)=LI
```

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```
50390 RETURN
50400 '***GET LINE # REFERENCE**
50410 LA=LA+1
50420 LR(LA)=LI
50430 GOSUB50520:IFC=32THEN50430
50440 IFD$="then"ANDPEEK(N-1)>12
9THEND$=""
50450 IFC>127THENLR(LA)=0:GOTO50
090
50460 IF(C<48ORC>57)THENLR(LA)=0
:D$="":GOSUB50320:GOTO50090
50470 LL=VAL(CHR$(C))
50480 GOSUB50520:IF(C>47ANDC<58)
THENLL=LL*10+VAL(CHR$(C)):GOTO50
480
50490 LA$(LA)=D$+STR$(LL)
50500 D$="":RETURN
50510 '***GET ASCII FOR NEXT C**
*
50520 C=PEEK(N):N=N+1:RETURN
50530 '***SKIP TO NEXT LINE ***
50540 N=PO-1
50550 PO=PEEK(N+2)+PEEK(N+1)*256
50560 LI=PEEK(N+4)+PEEK(N+3)*256
50570 IFLI>49999THEN50600ELSEN=N
+5:PRINT"... LINE #";LI
50580 RETURN
50590 '***PRINT THE LIST***
50600 PRINT:PRINT"   PROCESSING
COMPLETE ...":PRINT
50610 PL=1
50620 IFLR(PL)>0THENPRINTUSING"#
####";LR(PL);:PRINT"  ";
50630 IFLA$(PL)<>""THENPRINTLA$(
PL)
50640 PL=PL+1
50650 IFPL=FIX(PL/12)*12ANDPL<=L
A THENPRINT@471,"MORE ...":PRINT
:GOTO50670
50660 IFPL<=LA THEN50620ELSE5068
0
50670 IFINKEY$<>""THEN50620ELSE5
0670
50680 PRINT"***END OF LIST***":P
RINT@481,"WHAT WOULD YOU LIKE NO
W? ..."
50690 IFINKEY$<>""THEN50700ELSE5
0690
50700 CLS:PRINTTAB(25)"ENTER"
50710 PRINTTAB(3)"PRINT ON YOUR
PRINTER..P"
50720 PRINTTAB(3)"DISPLAY THE LI
ST ......D"
50730 PRINTTAB(3)"SHORT LIST ...
.........S"
50740 PRINTTAB(3)"END THE PROGRA
M .......E"
50750 PRINTTAB(22)"==> ";
50760 I$=INKEY$:IFI$=""THEN50760
50770 PRINTI$;" <=="
50780 IFI$="P"THEN50830
50790 IFI$="D"THEN50610
50800 IFI$="E"THENEND
50810 IFI$="S"THEN50880
50820 GOTO50700
50830 PL=1
50840 IFLR(PL)>0THENPRINT#-2,USI
NG"#####";LR(PL);:PRINT#-2,"  ";
50850 IFLA$(PL)<>""THENPRINT#-2,
LA$(PL)
50860 PL=PL+1
50870 IFPL<=LA THEN50840ELSE5068
0
50880 '*** SHORT LIST ***
50890 PRINT"ONE MOMENT PLEASE ..
.":PRINT"   short list":FORS=1TO
LA:FORT=1TOLA
50900 IFLA$(S)=""THENLA$(S)=" ":
GOTO50930
50910 IFASC(LA$(S))>96THENLA$(S)
=" ":GOTO50930
50920 IF LA$(S)=LA$(T)ANDS<>T TH
ENLA$(S)=" "
50930 NEXTT:NEXTS
50940 FORR=1TOLA
50950 IFLA$(R)<>" "THENPRINTLA$(
R);":";:Z=Z+1:LA$(Z)=LA$(R)
50960 NEXTR
50990 '***ALPHASORT THE LIST***
51000 N=Z:S=1
51010 PRINT:PRINT:PRINT"      NO
W SORTING ..."
51020 MN$=LA$(S):IM=S:MX$=MN$:IX
=S
51030 FORI=S TO N
51040 IFLA$(I)>MX$ THENMX$=LA$(I
):IX=I
51050 IFLA$(I)<MN$ THENMN$=LA$(I
):IM=I
51060 NEXT
51070 IFIM=N THENIM=IX
51080 AA$=LA$(N):LA$(N)=LA$(IX):
LA$(IX)=AA$:N=N-1
51090 AA$=LA$(S):LA$(S)=LA$(IM):
LA$(IM)=AA$:S=S+1
51100 IFN>S THEN51020
51110 FORI=1TOZ:PRINTLA$(I);"*";
:NEXT
51120 END
```

Listing 2: SPEEDUP

```
50001 POKE65497,0'HIGH SPEED
50601 POKE65496,0:POKE65494,0:SO
UND128,20:SOUND128,20 'RESETTING
 TO NORMAL SPEED
```

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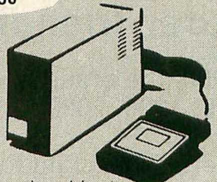

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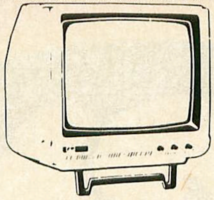

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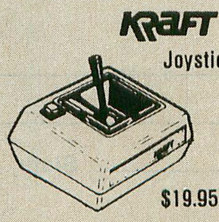

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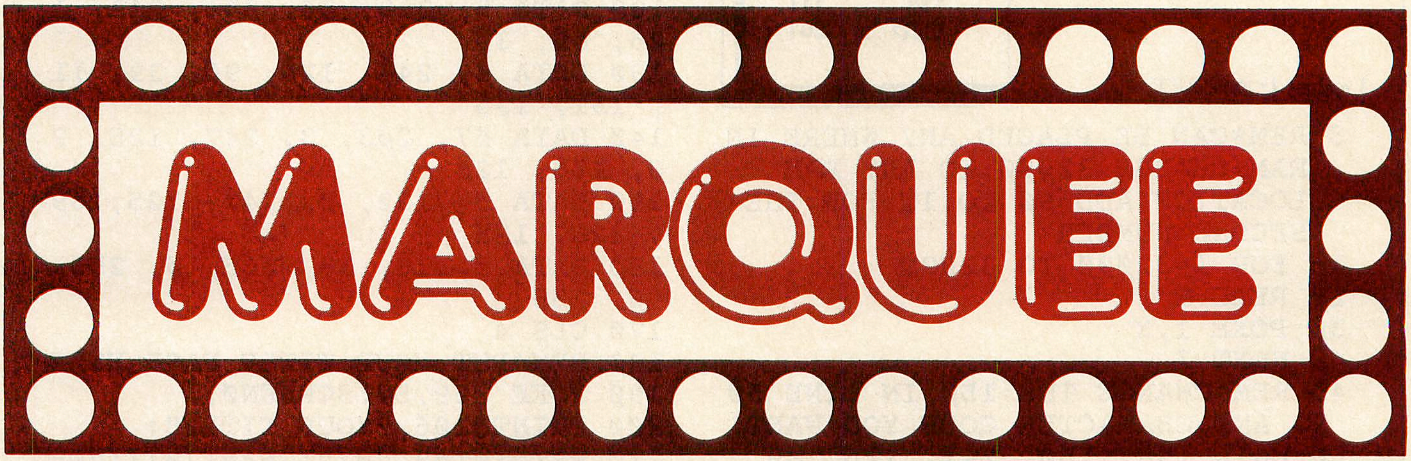

MARQUEE

By Chuck Poynter

You just wrote a new computer program that will set the world on fire — but something is missing. Do your title and menu screens lack pizazz? If that is what you need, then *Marquee* should help.

Listing 1 pokes a machine code program into memory that draws and moves a border around the screen. This is actually an illusion. What really happens is the graphics characters are changed back and forth, and it appears to be moving. The 150 in Line 50 is the yellow graphics character you start with. It changes to 153 during the program, then changes back to 150. To get the following colors, change 150 to one of the following numbers: red, 182; buff, 198; cyan, 214; orange, 246; blue, 166; and magenta, 230. You can use any character code from zero to 252. Try these and see the effects.

There is a title and menu screen in the program starting at Line 170. Start your program here and include `EXEC 32000` when you want to call the program. The ENTER, '1', '2' and '3' keys return to to the BASIC program. If you need more than three items in your menu, just break it into two menu screens.

Listing 2 is the source code for the machine language program. This is included so you can see how the program works. Both

---

Chuck Poynter is a retired member of the United States Air Force who is presently attending college where he is taking computer programming courses. He lives in Hector, Arkansas.

programs are well-documented so they don't need extensive explanation.

(You may contact the author of these programs with any questions you have at Box 116, Hector, AR 72843, phone 501-284-2383. When writing, please include an SASE for a reply.) □

130 117
END 201

Listing 1: MARQUEE

```
 5 REM*CAN BE PLACED ANY WHERE IN
   RAM CHANGE 32000 TO ANY RAM
   LOCATION ADD 90 TO IT FOR THE
   SECOND NUMBER
 10 FOR I=32000 TO 32090
 20 READ X
 30 POKE I,X
 40 NEXT I
 45 REM*CHANGE THE 150 IN LINE 50
  TO ANY CHARACTER CODE YOU WANT
 50 DATA 198, 150, 247, 125, 89,
 173, 159, 160
 60 DATA 0, 129, 13, 39, 57, 129,
  49, 39
 70 DATA 53, 129, 50, 39, 49, 129
 , 51, 39
 80 DATA 45, 142, 4, 0, 231, 128,
 140, 4
90 DATA 33, 38, 249, 142, 5, 223
, 231, 128
100 DATA 140, 6, 0, 38, 249, 142
, 4, 63
110 DATA 231, 128, 231, 128, 48,
 136, 30, 140
120 DATA 5, 223, 38, 244, 241, 1
25, 89, 39
130 DATA 8, 241, 125, 90, 39, 11
, 151, 135
140 DATA 57, 203, 3, 247, 125, 9
0, 126, 125
150 DATA 5, 192, 3, 247, 125, 89
, 126, 125
160 DATA 5, 18, 18, 255, 0, 255,
 0, 255
170 CLS 4
180 REM*PUT YOUR TITLE PAGE HERE
190 POKE 359,57:SCREEN0,1
200 PRINT@106,"YOUR TITLE";
210 PRINT@168,"BY";CHR$(191);"WH
O";CHR$(191);"DONE";CHR$(191);"I
T";
220 PRINT@452,"PRESS <ENTER> TO
CONTINUE";
230 EXEC32000
240 CLS 5
250 REM*PUT YOU MENU HERE
260 PRINT@70,STRING$(19,32);
270 PRINT@70+32,"(1) MENU ITEM O
NE  ";
280 PRINT@70+64,"(2) MENU ITEM T
WO  ";
290 PRINT@70+96,"(3) MENU ITEM T
HREE";
300 PRINT@70+128,STRING$(19,32);
310 EXEC32000
320 POKE359,126:SCREEN0,1
330 REM*CHANGE GOTO TO YOUR LINE
 NUMBERS
340 IF PEEK(135)=49 THEN GOTO 39
0
350 IF PEEK(135)=50 THEN GOTO 41
0
360 IF PEEK(135)=51 THEN GOTO 43
0
370 IF PEEK(135)=13 THEN GOTO 31
0
380 REM*YOUR PROGRAM STARTS HERE
390 CLS:PRINT"YOU HAVE SELECTED
MENU ITEM (1)";
400 END
410 CLS:PRINT"YOU HAVE SELECTED
MENU ITEM (2)";
420 END
430 CLS:PRINT"YOU HAVE SELECTED
MENU ITEM (3)";
440 END
```

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Listing 2:

```
7D00             00100          ORG     $7D00     CAN BE ANY WHERE IN RAM
7D00 C6   96     00110          LDB     #150      LOAD BORDER CODE
7D02 F7   7D59   00120          STB     STORE     STORE BORDER CODE IN RAM
7D05 AD   9F A000 00130 START   JSR     [$A000]   CHECK KEYBOARD
7D09 81   0D     00140          CMPA    #13       IS ENTER KEY PRESSED
7D0B 27   39     00150          BEQ     END       IF SO RETURN TO BASIC PROGRAM
7D0D 81   31     00160          CMPA    #49       IS THE 1 KEY PRESSED
7D0F 27   35     00170          BEQ     END       IF SO RETURN TO BASIC
7D11 81   32     00180          CMPA    #50       IS 2 KEY PRESSED
7D13 27   31     00190          BEQ     END       IF SO RETURN TO BASIC
7D15 81   33     00200          CMPA    #51       IS 3 KEY PRESSED
7D17 27   2D     00210          BEQ     END       IF SO RETURN TO BASIC
7D19 8E   0400   00220          LDX     #$400     LOAD START OF SCREEN
7D1C E7   80     00230 DRAW1    STB     ,X+       STORE CHARACTER ON SCREEN
7D1E 8C   0421   00240          CMPX    #$421     COMPARE FIRST LINE PLUS 1
7D21 26   F9     00250          BNE     DRAW1     IF NOT EQUAL DO MORE
7D23 8E   05DF   00260          LDX     #$5DF     FIRST CHARACTER BOTTOM LINE
7D26 E7   80     00270 DRAW2    STB     ,X+       STORE CHARACTER
7D28 8C   0600   00280          CMPX    #$600     END OF TEXT SCREEN
7D2B 26   F9     00290          BNE     DRAW2     IF NOT END CONTINUE
7D2D 8E   043F   00300          LDX     #$43F     LAST CHARACTER SECOND LINE
7D30 E7   80     00310 DRAW3    STB     ,X+       STORE CHARACTER
7D32 E7   80     00320          STB     ,X+       ONE MORE
7D34 30   88 1E  00330          LEAX    30,X      ADD 30 TO SCREEN POSITION
7D37 8C   05DF   00340          CMPX    #$5DF     LAST POSITION LINE 15
7D3A 26   F4     00350          BNE     DRAW3     DO UNTILL EQUAL
7D3C F1   7D59   00360          CMPB    STORE     IS CHARACTER SAME AS ONE IN RAM
7D3F 27   08     00370          BEQ     CHR1      IF EQUAL GET NEW CHARACTER
7D41 F1   7D5A   00380          CMPB    STORE+1   IS CHR SAME AS ONE IN RAM
7D44 27   0B     00390          BEQ     CHR2      IF EQUAL GET NEW CHR
7D46 97   87     00400 END      STA     135       STORE KEY PRESSED IN RAM
7D48 39          00410          RTS               RETURN TO BASIC PROGRAM
7D49 CB   03     00420 CHR1     ADDB    #3        CHANGE CHR BY +3
7D4B F7   7D5A   00430          STB     STORE+1   STORE NEW CHR IN RAM
7D4E 7E   7D05   00440          JMP     START     START OVER
7D51 C0   03     00450 CHR2     SUBB    #3        SUBTRACT 3 FROM CHR
7D53 F7   7D59   00460          STB     STORE     STORE NEW CHR IN RAM
7D56 7E   7D05   00470          JMP     START     START OVER
7D59 12          00480 STORE    NOP               CHR STORAGE AREA 1
7D5A 12          00490          NOP               CHR STORAGE AREA 2
          0000   00500          END
00000 TOTAL ERRORS
```

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PIPELINE

A FIRST FOR TANDY — Tandy Corporation reported sales exceeding half a billion dollars for the month of December. In addition they reported the corporation's first billion dollar quarter. December's 22 percent sales gains were the result of great demand for high quality computers and other electronics products to put under the Christmas tree. In addition to other items sold, the Color Computer found its way into many homes this Christmas.

* * *

HD BREAKTHROUGH — Tom Roginski has announced OWL-WARE's introduction of *Winchester BASIC.* This modification of Disk Extended BASIC allows the user to access a hard drive of virtually any size immediately upon power-up. File size is limited only by the size of the drive. Although it adds power to OS-9, knowledge of OS-9 is not a requirement for operating the system. All files written to the hard drive are easily accessible from BASIC or OS-9. All BASIC and most ML programs will run on this drive using *Winchester BASIC.* The modification is designed for use with the L.R. Tech interface, but OWL-WARE will provide customized versions if required. The price for *Winchester BASIC* is $50 with the purchase of a drive system. Hard drive systems start at $495 for five meg. For more information or to order, contact *OWL-WARE, P.O. Box 116-D, Mertztown, PA 19539.*

* * *

PREPARE FOR THE DERBY — Software Exchange has announced its new three-program package for all horse racing fans. The *Enhanced Racing Handicapped Program Package* contains software for thoroughbred, harness, and bet return analysis on disk or cassette. It is available for the CoCo for $49.95. Write to *Software Exchange, 2681 Peterboro Rd., P.O. Box 5382, W. Bloomfield, MI 48033.*

* * *

PHONE LINE BLUES? — R.K. Burtchaell Co. is now carrying a new product designed to allow private communications. The Hy-Tek Exclude-A-Phone offers modem isolation. If your computer is online and someone picks up an extension telephone, their phone will be dead. They won't hear anything and neither will your computer. Call (800) 342-5752 or write to *R.K. Burtchaell Co., 516 S.E. Morrison, Suite 201, Portland, OR 97214.*

* * *

MONSTERS? — Monster Cable has announced a new line of computer cables. The DataSafe™ Series consists of 10 quality cables developed to connect all popular computers to printers and modems. Suggested retail prices will range from $40 to $60. For cables for your Color Computer, write to *Monster Cable, 101 Townsend St., San Francisco, CA 94107.*

* * *

BUSINESS — Programmed Press announced its new 1.3 version of investment and statistical software. This is available in the form of a 220-page book which contains 50 BASIC programs for several business applications. The price for *The Computer-Assisted Investment Handbook*, is $19.95. Contact *Programmed Press, 2301 Baylis Ave., Elmont, NY 11003, (516) 775-0933.*

* * *

QUIETER DAISYWHEEL — C. Itoh has introduced a new 136-column, 40 cps daisywheel printer. The D10-40 is claimed to have an acoustic noise level of less than 60dB. It features three character pitches, compatibility with all Diablo printwheels, 8-bit parallel and RS-232C serial interfaces, and an 8K data buffer standard. Suggested retail is $949 which includes the C. Itoh one-year warranty. Options include an auto sheet feeder and a tractor feed mechanism. Contact *C. Itoh Digital Products, Inc., 19750 South Vermont Ave., Suite 220, Torrance, CA 90502, (800) 423-0300.*

* * *

KODAK DISKS — Eastman Kodak Company has a new line of single- and double-sided diskettes. The 300-oersted, 5-¼-inch disks are available in double- and quad-density formats for most applications. They can be found in packs of two, five and 10.

* * *

NEW CATALOG — The new Radio Shack computer catalog is now available in Radio Shack stores. Two new Color Computer items in this catalog are the DC Modem Program Pak and a hard disk interface. The modem runs at 300-Baud and is capable of originate and answer modes. Retail price for the modem is $89.95. The hard disk interface is designed for use with primary drives. It requires 64K, Multi-Pak Interface, floppy disk and OS-9 version 2.0 or later. It is available for $129.95. Both the modem and interface can be found at Radio Shack stores nationwide.

* * *

STORAGE — The Media Mate 5 XL Plus™, a locking disk file capable of storing 100 5-¼ inch diskettes was recently introduced by Amaray International Corporation. The unit holds disks at a 30-degree angle for easy reading and it is stackable. It is available through retailers nationwide for $29.95. Also available is the MediaPack 4. This product includes four color-coded disk cases capable of holding 10 disks each. The individual units may be locked together to form a large diskette library. The price for the MediaPack 4 is $16.95. For more information contact *Mark Dill, Amaray International Corporation, 14935 N.E. 95th Street, Redmond, WA 98052-2508, (206) 881-1000.*

* * *

BUFF WHO? — Computer Friends has announced the Mac Master universal buffer and printer controller. Memory options are 64K, 256K and one meg and the prices range from $299 to $750. The buffer can be used to store any information to be sent to peripherals while the controller feature can store up to 99 strings, which can be recalled from the front panel keyboard. Write to *Computer Friends, 6415 SW Canyon Ct., Portland, OR 97221, or call (800) 547-3303.*

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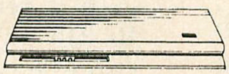

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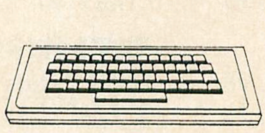

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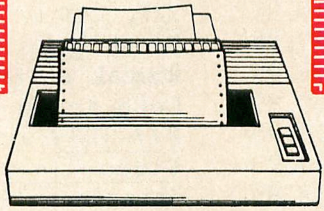

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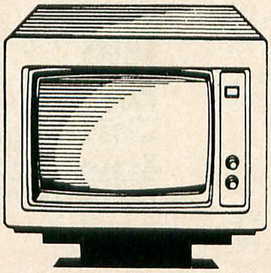

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16K
ECB

the RAINBOW

Invasion of the Flying Saucer People

By Allen B. Carlisle

If you like fast action games that challenge your reflexes and offer different skill levels, you will like *Saucer*. The scenario goes something like this: You are on a desolate planet, and while safe from attack from the dreaded Saucer people from within your base camp (lower right-hand corner of the graphics screen), you must venture out to get the supply boxes, which are present at the lower left-hand corner of the graphics screen. The moment you venture out, or your robot ventures out (for those who abhor violence), a saucer enters the scene and randomly flies around shooting its laser beam at you. If you are hit, another man, or robot, exits the base and heads for the needed supplies. Each player gets four men per round.

Allen Carlisle teaches math at Airline High School in Bossier City, Louisiana. He has a bachelor's degree and a master's in math from Texas Tech. He lives in Shreveport, Louisiana.

You are not left without defense, however, as you can shoot back by skillful use of the right joystick. Of course, the firebutton activates your laser gun, but aiming it takes a few attempts to master. Each time you succeed in knocking out a saucer, 100 points are scored. Aiming your gun involves watching a blinking cursor at the uppermost horizontal part of the screen or the far left vertical position of the graphics screen. Your ray fires at that cursor position as you press the button. Movement to the right of the joystick causes the cursor to appear at the top, while movement to the left moves the cursor to the left vertical part of the screen. Up on the joystick causes the cursor to move up the screen if it is at the left vertical position, and to the left if it is at the upper horizontal position. Of course, down performs the opposite movements.

When I decided to write *Saucer*, I knew the main mathematical task would be to obtain the formula that calculates the coordinates of the point on a line (laser ray) that is on the segment perpendicular to some other point off the line (center of the saucer). After having looked in all my analytical geometry texts, I found nothing that would give me what I needed, so I took some time to derive the formulae I needed. Line 1090 of this program is what gives the coordinates of this point (LX,LY), where (A,B) and (C,D) are two points of the laser beam shot at the saucer and (X,Y) is the coordinate of the center of the saucer. The actual distance is calculated in Line 1100.

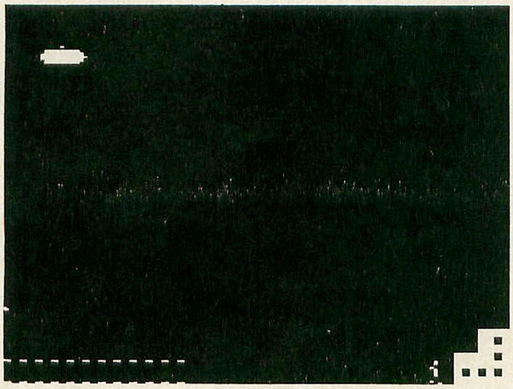
Variable QED is the test variable for this distance, which is larger for the lower skill level so that at skill level one, the beam does not necessarily have to touch the saucer in order to score a hit, but must be very close.

I invite inquiries concerning any aspect of this game. I have yet to score the 1,000 points obtained by successfully returning a supply box to base (but I got pretty close once). Write and let me know if you do or are able to do this at the higher skill levels. My address is 3533 San Augustine, Shreveport, LA 71105. I would like to hear from you. Good luck knocking those nasty Saucer people from the sky! ☐

```
250 .......32    970 ......154
380 ......182    1110 .....112
610 .......74    END .....254
770 ......138
```

The listing: SAUCER

```
10 REM SAUCER *****************
20 REM (C) ALLEN B. CARLISLE 198
5****
30 REM ALL RIGHTS RESERVED******
*
40 '*****************************
50 '*****************************
60 REM INITIALIZE GAME
70 CLS:PCLEAR4:POKE65495,0
80 DIMA$(4):DIMA(4):INPUT"NUMBER
 OF PLAYERS";ZZ
```



```
90 FOR PL=1 TO ZZ:CLS:INPUT"ENTE
R NAMES";A$(PL):NEXT:CLS:PL=1
100 INPUT"SKILL LEVEL(1-5)";L
110 IF L<1 OR L>5 THEN 100 ELSE
L=ABS(INT(L))
120 IF L=1 THEN 130 ELSE 140
130 DIS=0:QED=17:GOTO250
140 IF L=2 THEN 150 ELSE 160
150 DIS=1:QED=15:GOTO250
160 IF L=3 THEN 170 ELSE 180
170 DIS=3:QED=13:GOTO250
180 IF L=4 THEN 190 ELSE 200
190 DIS=3:QED=10:GOTO250
200 DIS=3:QED=8:GOTO250
210 IF PL>ZZ THEN PL=1
220 A(PL)=A(PL)+SCR
230 IF MEN=0 THEN PL=PL+1
240 IF MEN=0 THEN GOTO1170 ELSE
RETURN
250 REM DRAW SAUCER & GET IT
260 PMODE4,1:U=214:SCREEN1,1:PCL
S0:MEN=8
270 H1=20:H2=44:V1=7:V2=7:V3=7:V
4=7:FL=-1:BOX=0:M=92
280 FOR I=1 TO 4: LINE(H1,V3)-(H
2,V4),PSET:LINE(H1,V1)-(H2,V2),P
SET
290 H1=H1+1:H2=H2-1:V1=V1-1:V2=V
2-1:V3=V3+1:V4=V4+1:PSET(31,2):P
SET(32,2):NEXT
300 DIMS(12,26):GET(19,1)-(45,13
),S,G:LINE(19,1)-(45,13),PRESET,
BF
310 REM DRAW &GET ROBOT
320 DRAW"BM217,180R3D1L3R2D6L1U3
L1;B;U1L2U1;B;D9R1U1;B;R1U2;B;R3
D1;B;R1;B;D1D1L1"
330 DIMR(11,8):GET(214,180)-(222
,191),R,G
340 REM DRAW BASE
350 LINE(240,164)-(255,191),PSET
,BF:LINE(228,176)-(244,191),PSET
,BF
360 FOR I=168 TO 184 STEP 8:LINE
(248,I)-(251,I+3),PRESET,BF:NEXT
370 LINE(232,184)-(235,187),PRES
ET,BF:LINE(240,184)-(243,187),PR
ESET,BF
380 REM DRAW SUPPLY BOXES
390 FOR I=0 TO 88 STEP 8
400 LINE(I,180)-(I+3,191),PSET,B
:NEXT:SCREEN1,1
410 REM ENTER SAUCER
420 FOR I=0 TO 128 STEP 8
430 W=20
440 PUT(I,20)-(I+26,32),S,PSET
450 LINE(I,20)-(I+26,32),PRESET,
BF
460 ABR=RND(9):IF ABR=2 THEN 480
ELSENEXT
470 GOTO 490
480 GOTO 510
490 I=128:PUT(I,W)-(I+26,W+12),S
,PSET:GOTO510
500 REM MOVE SAUCER
510 Q1=RND(0):IF Q1<.5 THEN A=-1
 ELSE A=1
520 Q2=RND(0):IF Q2<.5 THEN B=-1
 ELSE B=1:H=RND(6):V=RND(6)
530 H=H*A:V=V*B:L=RND(20)
540 FOR E=1 TO L
550 IF I>226 THEN 630
560 IF W>140 THEN 630
570 IF I<0 THEN 630
580 IF W<0 THEN 630
590 PUT(I,W)-(I+26,W+12),S,PSET:
X=I:Y=W
600 GOSUB 640
610 LINE(I,W)-(I+26,W+12),PRESET
,BF:I=I+H:W=W+V
620 NEXT:GOTO630
630 PUT(X,Y)-(X+26,Y+12),S,PSET:
GOSUB780:FOR DLY=1 TO 2:SOUND216
,1:SOUND226,1:GOSUB 820:NEXT:I=X
:W=Y:GOSUB860:GOTO510
```

⌖⌖⌖ COLORFUL UTILITIES ⌖⌖⌖

COCO CHECKER*

Something possibly wrong with your CoCo??? CoCo CHECKER is the answer!! Will test your ROMs, RAMs, Disk Drives & Controller, Printer, Keyboard, Cassette, Joysticks, Sound, PIAs, VDG, Internal Clock Speed, Multi-Pak Interface and more!! 16K TAPE/DISK **$19.95** (see Jan '85 Rainbow Review)

MULTI-PAK CRAK

Save ROMPAKs to your 64K Disk system using the RS Multi-Pak Interface. Eliminate constant plugging in of ROMPAKs now by keeping all your PAK software on disk. Includes POKEs for "PROBLEM" ROMPAKs. (Downland, Megabug, Micro Painter, Stellar Lifeline, etc..) 64K DISK **$24.95**

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Will format & backup a disk in only 1 PASS (up to 23 grans) & make up to 4 copies in 2 minutes! The must utility for every multiple Drive owner. 32K DISK **$14.95** (see May'85 Rainbow Review)

SPIT 'N IMAGE

A super upgrade from Disk Omni Clone! Back everything up! This amazing program handles "non standard" disks with ease. We haven't found any disk yet that it can't handle. Don't ever be caught without a backup again! Lowest price too! Beats most "copy protection" programs! 32K DISK **$29.95**

COCO SCREEN DUMP

The best screen dump program for the Panasonic, Epson & Gemini printers ever! Have the option of standard or reverse images w/regular or double sized proportional pictures. 600-9600 Baud too! A must for Graphicom and Bjork Block users. 16K TAPE/DISK **$19.95** (see Nov '84 Rainbow Review)

DISK UTILITY 2.1*

A multi-featured tool for USER FRIENDLY disk handling. Utilize a directory window to selectively sort, move, rename and kill file entries. Lightning fast Disk I/O for format, copy and backup. Examine contents of files, the Granule Table, plus the size, load addresses and entry points of all programs. Single command execution of both Basic and ML programs. 32K/64K DISK **$24.95** "Disk Utility has proven itself very quickly at my house" - Ed Ellers Oct '84 Rainbow Review pg. 220

NEW!

SPECTRUM FONT GENERATOR

Now you can write files using any CoCo Word Processor (Telewriter-64, VIP Writer, etc.) and convert them to special Highly Detailed character sets! Some of the character sets supported are Italics, Old English, Futuristic and Block. A character set editor is included to create custom sets or modify existing ones! Supports most dot-matrix printers! DISK **$29.95** (see Dec '85 Rainbow Review)

SPECTRUM DOS

Add 24 NEW Disk commands with 2 Hi-Res screens! Supports 40 track & Double-Sided drives, 6 ms stepping, auto disk search, error trapping & "EPROMABLE". 64K DISK ~~$49.95~~ New LOW price!! **$24.95**

SCHEMATIC DRAFTING PROCESSOR

Save time and design pro looking diagrams using a 480X540 pixel worksheet w/6 viewing windows. Over 30 electronic symbols w/10 definable symbols. (Even Logic gates & Multipin chips!) Print hard copy and save to disk. 64K DISK ~~$49.95~~ New LOW price!!! **$29.95** (see Jan '84 Rainbow Review)

NEW!

BASIC+

Basic+ provides (23) of the most used BASIC cmds w/one keystroke plus scrolling & editing w/single key! Also included is a 32 character typahead BUFFERED keybd w/auto key & repeat plus a 32K Print Spooler!! And all that appears on the screen can be echoed to the ptr! 64K DISK **$29.95**

COCO CHECKBOOK

Use your CoCo to keep track of your checking and savings accounts! Printout individual personal checks! 32K/64K TAPE **$29.95** DISK **$39.95** (see April'85 pg. 210 & Oct'85 pg. 197 Rainbow Reviews)

* NOW AVAILABLE BY EXPRESS ORDER AT YOUR LOCAL RADIO SHACK STORE -

#90-0289 COCO CHECKER - #90-0290 DISK UTILITY 2.1

BUY ANY 4 PROGRAMS GET THE FIFTH FREE !*

* - No other discounts can be applied

DEMAND TO SEE THE DEMO DISK !!!
(FC#0919)

⌖⌖⌖ COLORFUL UTILITIES ⌖⌖⌖

COCO TEXT UTIL

NEW!

Includes utilities that most CoCo word processors (TW-64, VIP Writer, etc.) leave out! Reset margins to correct length for uploading, convert all UPPER CASE text to mixed upper/lower, display total BYTE count, EASY rename & kill functions plus read or print ANY disk file! DISK **$19.95**

COCO VIDEO TITLER

Start your VCR tapes with dazzling title frames followed by professional countdown to black fade-outs! Use a title page editor with several sizes of text & background colors! 16K TAPE **$19.95**

PENPAL

NEW!

It's here! CoCo's answer to 1-2-3! PENPAL combines Word Processing, Communications, Graphics, Data Base & Spread-sheet into a single integrated software package! 64K DISK INTRO PRICE **$69.95**

64K DISK UTILITY PACKAGE

Take advantage of an expanded 64K machine. Make an additional 8K of RAM available by relocating the Ext Basic ROM from $8000 to $D800. Copy ROMPAKS to disk (even "protected" PAKS) and create a 32K SPOOL buffer for printing. DISK **$21.95** (see July '83 Rainbow Review)

TAPE/DISK UTILITY

A powerful package that transfers tape to disk and disk to tape automatically. Does an automatic copy of an entire disk of programs to tape. Ideal for Rainbow On Tape to disk. Also copies tape to tape & prints tape & disk directories. TAPE/DISK **$24.95** (see Sept '83 Rainbow Review)

FAST TAPE

Save and load cassette files at twice the speed! Now you can run tape and printer I/O operations in the high speed mode without a locked up system or I/O ERRORS! Works great with the popular Telewriter-64 word processor tape by Cognitec. "If you are tired of waiting for those long tapes to load, I strongly recommend that you buy this fine utility." TAPE **$21.95** July '83 Rainbow

COCO CALENDAR

NEW!

Get organized for '86 TODAY with the CoCo Calendar! Designed for recording the entire year's occassions and daily appointments so you can plan ahead. You can store HUNDREDS of entries and our GRAPHIC Calendar will show the DAYS that have all the MEMOS! 32/64K DISK **$24.95**

THE OS-9 SOLUTION

NOW, a program that creates a "USER FRIENDLY" environment within OS-9! The OS-9 SOLUTION replaces 19 of the old "USER HOSTILE" commands with single keystroke, menu driven commands. No more typing in complex long pathnames or remembering complicated syntaxes! Set all XMODE parameters at the touch of keys! Requires OS-9 ver.01.01.00 **$39.95** (see Sept '85 Rainbow Review)

COCO-UTIL

NEW!

Now you can have the power to easily transfer Radio Shack Color Computer disk files to your MS-DOS machine - including the Tandy 1000 & IBM PC!!! You can also transfer MS-DOS files to your CoCo disk, even format CoCo disks! CoCo-Util will save you countless hours of retyping! No need to move your computer or printer anymore! Requires 128K MS-DOS computer w/2 disk drives - **$29.95**

SOFTWARE BONANZA PACKAGE

Create an instant library of Spectrum Projects TOP Colorful Utility software. Select any 10 programs to customize your own SPECTACULAR SOFTWARE BONANZA! CoCo Checker, Multi-Pak Crak, CoCo Screen Dump, Disk Utility 2.1, Spectrum Font Generator, Tape/Disk Utility, Fast Dupe II, Schematic Drafting Processor, OS-9 Solution, 64K Disk Utility or Basic+ (a $250 plus value) for only **$119.95**!!

All orders plus $3.00 S/H (Foreign $5.00) - COD add $2.00 extra - NYS Residents add Sales Tax

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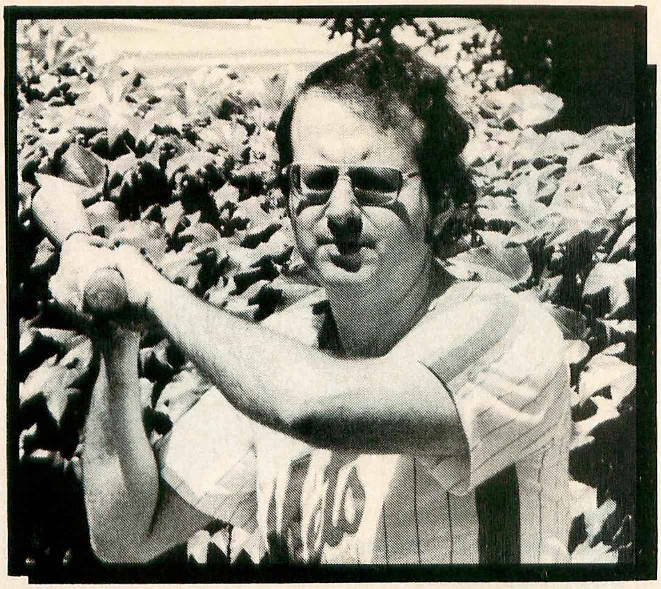
WOODHAVEN NY 11421
COD ORDER HOT LINE 718-441-2807

```
640 REM MOVE ROBOT
650 GOSUB860
660 IF FL>0 THEN 700
670 LINE(U,180)-(U+8,191),PRESET
,BF:U=U-1:PUT(U,180)-(U+8,191),R
,PSET
680 IF M=U THEN 690 ELSE RETURN
690 FL=FL*-1:BOX=BOX+1:IF BOX=1
THEN 750 ELSE U=U-8
700 IF U<0 THEN U=0
710 LINE(U,180)-(U+13,191),PRESE
T,BF:PUT(U,180)-(U+13,191),B,PSE
T:U=U+1
720 IF U=215 THEN 730 ELSE RETUR
N
730 LINE(U,180)-(U+13,191),PRESE
T,BF:FL=FL*-1:U=214:PUT(U,180)-(
U+13,191),R,PSET
740 M=M-8:SCR=1000:GOSUB210:IF M
<4 THEN 1250 ELSE RETURN
750 REM GET ROBOT & BOX
760 DIMB(11,13):GET(87,180)-(100
,191),B,G:U=87:GOTO 700
770 REM SHOOT LASER BEAM
780 XX=X+13:L=U+4:R1=RND(5):R2=R
ND(5):R3=RND(5):R=R1+R2+R3
790 IF L-9+R<0 THEN R=9
800 LINE(XX,Y)-(L-8+R,191),PSET:
FOR DLY=1 TO 40:NEXT
810 LINE(XX,Y)-(L-8+R,191),PRESE
T:RETURN
820 IF ABS(R-8)<=DIS THEN 830 EL
SE RETURN
830 LINE(U,180)-(U+8,191),PRESET
,BF:MEN=MEN-1
840 SCR=0
850 U=214:FL=-1:GOSUB210:RETURN
860 REM ROBOT SHOOTS
870 K=PEEK(65280):IF K=126 OR K=
254 THEN 1020
880 J0=JOYSTK(0):J1=JOYSTK(1)
890 IF J1>54 THEN UN=UN+8
900 IF J1>45 AND J1<=54 THEN UN=
UN+5
910 IF J1>36 AND J1<=45 THEN UN=
UN+2
920 IF J1>27 AND J1<=36 THEN UN=
UN
930 IF J1>18 AND J1<=27 THEN UN=
UN-2
940 IF J1>9 AND J1<=18 THEN UN=U
N-5
950 IF J1>=0 AND J1<=9 THEN UN=U
N-8
960 IF UN<0 THEN UN=0
970 IF J0>32 THEN 1000
980 IF UN>160 THEN UN=160
990 LINE(0,UN)-(4,UN+4),PSET,BF
:LINE(0,UN)-(4,UN+4),PRESET,BF:R
ETURN
1000 IF UN>254 THEN UN=254
1010 LINE(UN,0)-(UN+4,4),PSET,BF
:LINE(UN,0)-(UN+4,4),PRESET,BF:R
ETURN
1020 IF J0>32 THEN 1050
1030 A=0:B=UN:C=U:D=180
1040 LINE(0,UN)-(U,180),PSET:FOR
 DLY=1TO2:SOUND216,1:SOUND226,1:
NEXT:GOSUB1070:LINE(0,UN)-(U,180
),PRESET:RETURN
1050 LINE(UN,0)-(U,180),PSET:A=U
N:B=0:C=U:D=180
1060 FORDLY=1TO2:SOUND216,1:SOUN
D226,1:NEXT:GOSUB1070:LINE(UN,0)
-(U,180),PRESET:RETURN
1070 REM CHECK IF SAUCER HIT
1080 X=X+13:Y=Y+6
1090 LX=(X*(C-A)^2+A*(D-B)^2+(D-
B)*(C-A)*(Y-B))/((D-B)^2+(C-A)^2
):LY=(B*(C-A)^2+Y*(B-D)^2+(B-D)*
(C-A)*(A-X))/((D-B)^2+(C-A)^2)
1100 IF SQR((LY-Y)^2+(LX-X)^2)<=
QED THEN 1120
1110 X=X-13:Y=Y-6:FORDLY=1TOX:AB
R=RND(0):NEXT:RETURN
1120 REM SAUCER HIT
1130 LINE(I,W)-(I+26,W+12),PRESE
T,BF:FORDLY=1TO20:SOUND200,1:RH=
RND(26):RV=RND(12):PSET(I+RH,W+R
V):NEXT:X=X-13:Y=Y-6
1140 LINE(I,W)-(I+26,W+12),PRESE
T,BF
1150 IF J0>32 THEN LINE(UN,0)-(U
,180),PRESETELSELINE(0,UN)-(U,18
0),PRESET
1160 SCR=100:GOSUB210:GOTO410
1170 CLS:FORK=1 TO ZZ:PRINT@(64+
K*64),A$(K);"'S SCORE= ";A(K):NE
XT
1180 PRINT@384,"TO END GAME PRES
S 'E'":PRINT@352,"NEXT ROUND PRE
SS 'N'"
1190 B$=INKEY$:IF B$="E"THEN1260
ELSE IFB$="N"THEN1220ELSEIFFLAG=
1THENRETURNELSE1190
1200 IF FLAG=1THENRETURN
1210 CLS
1220 IF PL>ZZ THEN PL=1
1230 PRINT@230,"R E A D Y ";A$(P
L);:FORDLY=1TO 5000:NEXT
1240 LINE(X,Y)-(X+26,Y+12),PRESE
T,BF:SCREEN1,1:MEN=8:GOTO410
1250 CLS:PRINT@103,"G A M E  O V
 E R !!!!":NEXT:FOR DLY=1 TO 150
00:NEXT:FLAG=1:GOSUB1170
1260 POKE113,0:EXEC40999
```



- CoCo Legends Collection - Bob "Whiffle" Rosen

SPECTRUM
STRIKES
BACK !!!
AGAIN !!!

256K/512K RAM UPGRADES FOR COCO II ARE HERE !

256K THUNDER RAM 256K

STRIKE 1 - RAM !

Easy installation, software and tech information!
(NOT available for CoCo II's)

OS-9 DRIVER $24.95

The first 256K memory Bd for the CoCo! Load four 32K pgms at once, emulate a 40trk RAMDISK, 60K Print Spooler, FAST access, 30+ Hi-Res screens in memory!! $99.95 (see Sept '85 Rainbow Review)

DOUBLE RAM - Upgrades a THUNDER RAM from 256K to 512K giving TWO independent RAM Disks! $79.95

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STRIKE 3 - A HIT !

Feature packed hardware & software Graphics System! Includes: Pull-Down Menus, Icon processing, multiple Font styles, full graphic editing plus a special Input Module for 256x192 joystick input.
64K DISK $79.95
Requires Multi-Pak or Y-Cable ($29.95)
CoCo Max I - II Disk Upgrade - $19.95
CoCo Max (TAPE) $69.95 Digitizer $149.95

SUPER CONTROLLER

STRIKE 2 - DOS !

Uses 2764 ($6.95) or 27128 ($14.95) EPROMS !

EPROM Programmer ↓ $59.95 ↓
(Requires Super Controller)

The most AMAZING CoCo Disk Controller ever! Switch up to 4 DOS's (up to 16K) via a single software POKE! Choose between R/S 1.0/1.1, Spectrum DOS, ADOS, JDOS, Stearman DOS - $99.95

DISPLAY 80 - 80 column display, RTC, & Ptr port. (Req. Super Controller) $99.95

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SUPER RAM - A 256K/512K memory RAM DISK for CoCo II's ! ! Requires Radio Shack Multi-Pak. Write for more information !

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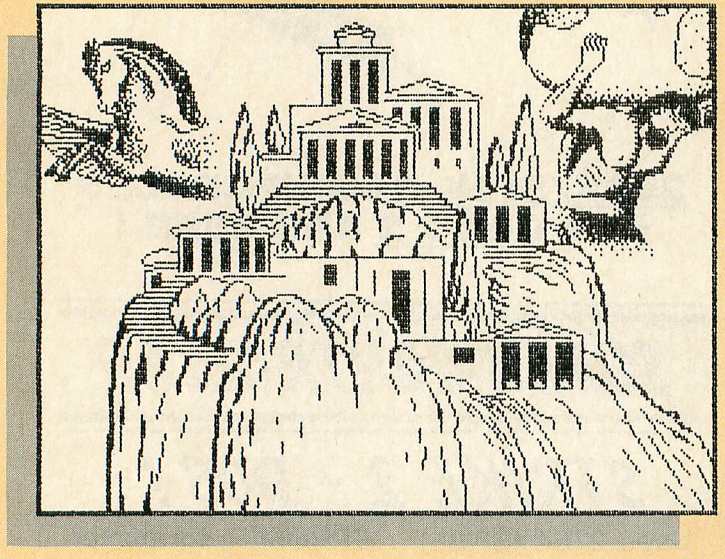
COD Order Line 718-441-2807

The CoCo Gallery

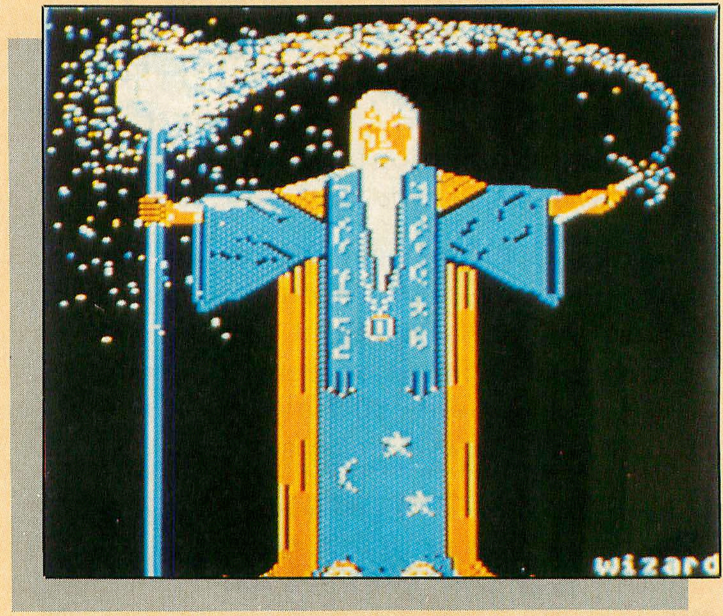


1st PRIZE

Robbie Elam

Mount Olympus

The month of Mars (March) presents a gallery of mythology and magic as it opens with Robbie's depiction of the home of the gods in ancient Greece. Robbie used a "homemade graphics editor" and lives Panama City Beach, Florida.

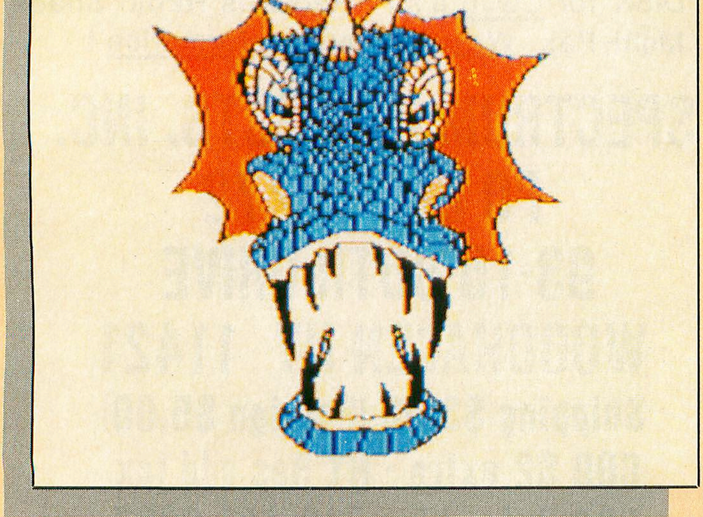


2nd PRIZE

Rick Hebert

Wizard

A portrait of a wizard busily enchanting garners second prize for Rick, who lives in Crowley, Louisiana. He used *Graphicom I & II* to give the gallery a glimpse of augury.

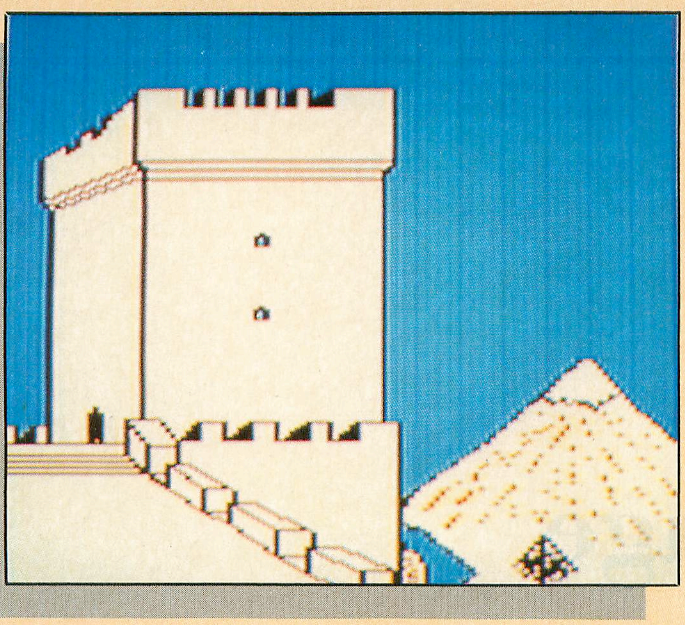


3rd PRIZE

Chris Steeves

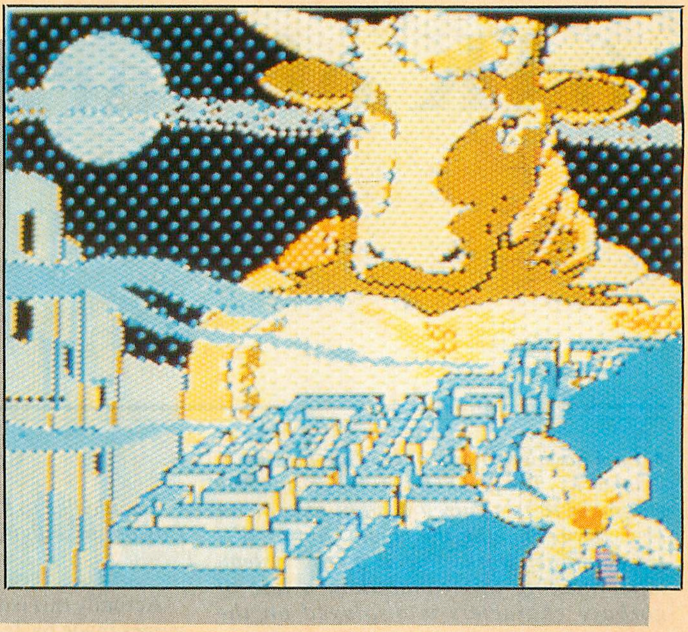
Dragon

A snarling dragon ogles patrons of the gallery courtesy of Chris who lives in Fredericton, New Brunswick. Using *Graphicom*, Chris created a rapacious reptile for our third prize winner.



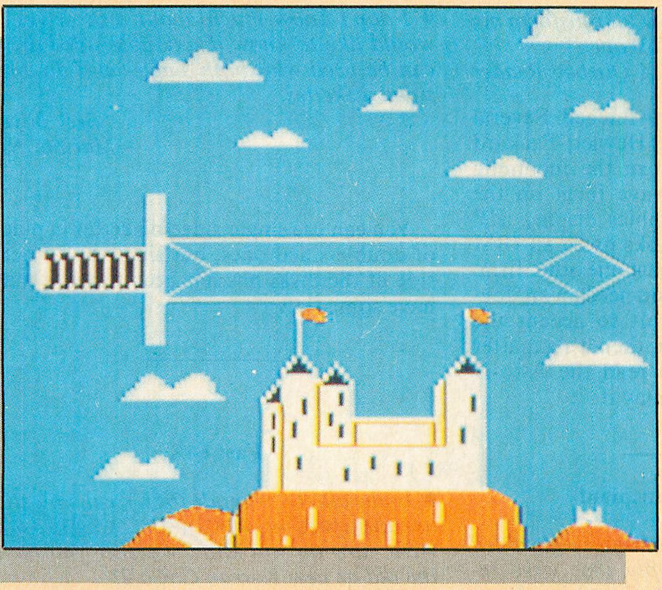
HONORABLE MENTION

Andrew Bartels
Tower
Andrew submitted this majestic tower standing unguarded in unknown realms. Andrew lives in Sulphur, Oklahoma, and used a graphics program he wrote.



HONORABLE MENTION

Charlie Fulp
Minotaur's Kingdom
Using *CoCo Max*, Charlie gifts the gallery with the sweeping grandeur of the Minotaur's Kingdom. Charlie lives in South Boston, Virginia.



HONORABLE MENTION

Sam Gladstone
Excalibur
No self-respecting gallery of myths could close without a depiction of King Arthur's gift from the Lady of the Lake. Sam used Extended BASIC to create this legendary sword.

SHOWCASE YOUR BEST!

You are invited to nominate original work for inclusion in upcoming showings of "CoCo Gallery." Share your creations with the CoCo Community!

Be sure to send a cover letter with your name, address and phone number, detailing how you created your picture (what programs you used, etc.) and how to display it. Also, please include a few facts about yourself.

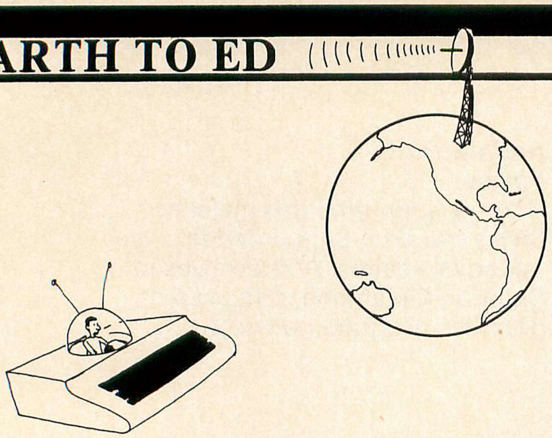
Don't send us anything owned by someone else; this means no game screens, digitized images from TV programs or material that's already been submitted elsewhere.

We will award a first prize of $25, a second prize of $15 and a third prize of $10. Honorable mentions will also be given.

Monica Dorth, Curator

Send your entry on either tape or disk to:
CoCo Gallery
THE RAINBOW
P.O. Box 385
Prospect, KY 40059
Attn: Monica Dorth

EARTH TO ED



64K of Garbage

By Ed Ellers
Rainbow Technical Writer

- *I am having trouble upgrading my CoCo 2 to 64K. The problem is in getting the computer to recognize the additional memory. Before making the connection at W1, the computer works fine as a 16K system. After making this connection, a line of garbage characters is displayed on the screen.*

Paul Masline
Wilton, CT

There is probably a defect in one or more of your new chips that affects some memory locations above the 16K boundary. With W1 open, your CoCo doesn't try to look for any more than 16K.

Programming in Stages

- *Is it possible to type in part of a program, save it on cassette and then finish the job later?*

Neil Edge
Williston, FL

Sure. There's nothing wrong with this procedure. In fact, it's a good idea to stop once in a while.

Ed Ellers, a RAINBOW *and* PCM *staff member, is a self-confessed electronics fanatic whose other interests include science fiction.*

CoCoScope

- *I would like to know how to transform my CoCo into a digital oscilloscope.*

A Quebec Reader

Actually this isn't too far-fetched. Several scopes made by Tektronix, Hewlett-Packard and others actually digitize the incoming signal and display the wave form on the CRT as a bit-image graphics display. HP also has a system that hooks up to an IBM PC to do this, as does at least one other firm. To do this on the CoCo, you need an analog-to-digital converter circuit to accept the signal you want to look at; then it's a matter of writing a program to read the A-to-D converter output and display it.

Disk Drive Transplant

- *I currently have two Tandon single-sided drives and a power supply that were removed from an IBM PC. Can these drives be used with the Color Computer? If so, what disk drive controller is best?*

Leon Donbrowski
Ripon, WI

The drives you mention will work fine with the CoCo using any of the standard disk controllers on the market. You might want to look at the IBM PC Hardware Reference Manual to find out how to set up the jumpers on these drives.

Single vs. Double

- *I don't know much about disk drives. I would like to know if a double-sided drive can be used with both single- and double-sided diskettes.*

Bret Boyer
Marion, NC

You can use single-sided diskettes in place of double-sided ones, but since the "other" side of the disks has not been tested it may have some flaws.

Fast 64K

- *In the all-RAM mode (64K), can you still use the speed-up* `POKE` *(*`POKE 65495, 0`*)? Also, how do you know whether you have the old or new Korean CoCo 2?*

Gregory Hill
Chicago, IL

Yes, you can speed up your computer's operation in the all-RAM mode — *if* your CoCo can accept the speed-up `POKE` at all.

Actually, there are three different versions of the CoCo 2 that have been made in Korea. The "old" one had a model number such as 26-3134 without a letter on the end; this has eight RAM chips. The "new" version had the letter 'A' on the end of the model number;

it uses two four-bit RAM chips and you would need 64K-by-four RAMs, such as 4464 or uPD41254, to upgrade it to 64K. The current model, the 'B' version, is called Tandy instead of Radio Shack; this one uses two four-bit RAM chips and has a new video generator chip that provides both upper- and lowercase displays on the text screen.

CAT Connections

• *I am trying to interface a Novation CAT modem to my CoCo. My problem is there are too many wires on the modem side. Would I also connect Pin 5 (clear to send) and Pin 6 (data set ready) to the CoCo's carrier detect input, or would I just leave these unhooked as unneeded items?*

Richard S. Nordell
Reeds, MO

Since the CoCo's Serial I/O jack has only three active lines (transmit, receive and carrier detect), terminal programs for the CoCo are written to use only these three and there's no problem with leaving the others disconnected. In fact, although it's good practice to go ahead and connect the carrier detect line (Pin 8 on the modem), many terminal programs don't use it either.

Key Bounce

• *I'm having a problem with the '5' key on my CoCo. I have a nice keyboard, but this key repeats two or three times when pressed. As you can tell, this creates an aggravating problem when entering programs. Would you please explain the problem?*

Mike Wells
Chesterton, IN

I've noticed some minor "key bounce" problems with the newer CoCo keyboards myself. Almost all key switches tend to bounce a bit, and because of this, a delay is used to make sure the extra pulses are ignored. Apparently the CoCo's key bounce delay, which was set for the original "chiclet" keyboard, may be just a bit short for the newer keyboards.

More on Touch-Up Paint

• *Regarding touch-up paint for the ol' gray CoCo: We don't have a Mercedes dealer where I live, but I found a touch-up paint that seems to match quite well. It is Dupli-Color's DS-GM-224, Silver (for 1975-76 Chevrolets, etc.).*

Jerold Krempel
Chenango Bridge, NY

Thanks for the information, Jerold.

Delphi Downloading

• *In November of 1985 I signed up with Delphi and joined the CoCo SIG. I tried to download the machine language files of* Mikeyterm 4.0, *but I don't know how to save it to disk using the* Autoterm *program.*

Joseph Zak
Parma, OH

The machine language files on Delphi should be downloaded using an XMODEM terminal program such as *Mikeyterm, Color Connection III* or *Colorcom/E Version 3*. In the case of *Mikeyterm*, just skip the first machine language file and download the other files. Run the four BASIC loader programs (*MTERM1*, *MTERM2*, *MTERM3* and *MTERM4*) in order, and you'll be able to save the *Mikeyterm* program to tape or disk.

With a 300-ohm antenna input you're most likely picking up garbage through the short wire from the antenna screws to the VHF tuner inside the set . . . your best bet is to use a good outdoor TV antenna with a coaxial cable lead-in.

Making Book

• *I would like to know how to get the Delphi Handbook and Command Card. The advertisement says I can order it online, but how do I go about it?*

Brandon Rhodes
Andover, MA

If you haven't already signed up for Delphi, when you do so you'll be asked whether you want to buy the Handbook, Command Card and three hours of connect time atot a special price. If you're already using Delphi, just send a mail message to SERVICE to order the Handbook and Command Card. Either way, the cost appears on your Delphi bill. You may also phone in an order to Delphi's toll-free line: (800) 544-4005.

Also, you'll find a special edition of the Delphi Command Card in the February 1986 RAINBOW on pages 89 and 90.

RFI Revisited

From Delphi Forum

• I have a problem with RFI from my CoCo 2 (not Korean). After running coax from the CoCo directly to my TV's VHF antenna terminals (replaced box with matcher) and grounding the matcher to TV chassis, I have eliminated 50 percent of my interference. However, I still have vertical interference lines, distinct and about four lines per inch. When using the CoCo, the TV in the next room also shows this interference pattern. My TV is a brand new 13-incher, which has only a 300-ohm twin-lead connection. Any suggestions?

Would a monitor eliminate my RFI problem (as a last resort)? If so, what is the difference between an "RGB" and a "composite color" monitor? I believe a TV is about 320 lines. If so, does CoCo have the ability to use a monitor with higher resolution? Say 500 or 800 lines?

Dennis Lytle
(Delphi username: DENNISGEORGE*)*
Saginaw, MI

Actually, you've done about all you can do with that TV set. On my own TV (a 19-inch RCA ColorTrak), which has a 75-ohm coaxial antenna input, the path from the CoCo to the TV is fully shielded and I get a very nice picture. With a 300-ohm antenna input you're most likely picking up garbage through the short wire from the antenna screws to the VHF tuner inside the set.

To clear up the interference on the other set, your best bet is to use a good outdoor TV antenna with a coaxial cable lead-in.

The Federal Communications Commission has a pamphlet, called "How to Identify and Resolve Radio-TV Interference Problems," that might be helpful to you. Write to: U.S. Government Printing Office, Washington, DC 20402, and ask for Stock Number 004-000-00345-4.

Your technical questions are welcomed. Please address them to: Earth to Ed, THE RAINBOW, P.O. Box 385, Prospect, KY 40059. We reserve the right to publish only questions of general interest and to edit for space and clarity.

Your technical questions may also be sent to us through the MAIL section of our new Delphi CoCo SIG. From the CoCo SIG> prompt, pick DELPHI MAIL, then type SEND **and address to:** EDELLERS.

GAMES

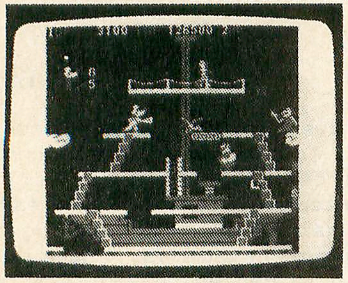
Requires 64K Machine Language

THE SAILOR MAN

TAPE $29.95
DISK $34.95

The first screen objective is to catch enough of Elsie's kisses (those Red Heart Shaped Things) to fill in the squares on the Sailorman's house. If you can time your punch just so, you can send the punching bag over to knock the bucket down and, with a little bit of luck, right on **Bigfatbadguy's** head. This will give you a little (but not much) time to catch all those RHSTs.

You must avoid contact with **Bigfatbadguy** who is actively pursuing you. You must also be careful of **Olduglyseawoman** who will appear at higher difficulty levels to chuck empties at you. Either avoid the flying bottles or punch them (with the fire button) to keep from being knocked into the water.



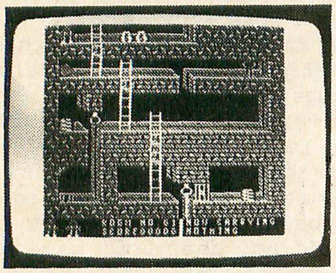
The second screen objective is to collect enough notes to play Elsie a little love song. You may jump off and onto the other end of **Fatguyeatinghamburger's** teetertotter to fly up a deck and even two decks if you manage to catch hold of **Smartaleckkid's** grab handles. Time it right and away you go.

The Third screen objective is to collect enough letters (thrown by Elsie's cries for H-E-L-P) to complete a ladder all the way to the crow's nest where Elsie is calling you. Beware of the Crow, however, who thinks you are after her eggs!

On all screens, eating a can of collard greens (labeled "S" for Collard and grasped by punching the can just right) will give you amazing speed, strength and ability and allow you to send **Bigfatbadguy** into the drink with a single punch.

DRAGON SLAYER

NEW



Save the villagers of Pendor! They live in fear of Icarus, the blood thirsty dragon. The dragon lives in a cave, way up in the mountains. The cave is a treasure chest, full of gems and cashbags. The trail to the cave is as menacing as Icarus himself. Outstanding graphics throughout. 160 screens of exciting action packed arcade excitement.

32K **Disk $29.95**

THE KING **32K**
Tape $26.95 **Disk $29.95**

SR-71 **32K**
Tape 28.95 **Disk $31.95**

DRACONIAN **32K**
Tape $27.95 **Disk $30.95**

MS. MAZE **32K**
Tape $24.95 **Disk $27.95**

FROG **16K**
Tape $27.95 **Disk $30.95**

FANGMAN **16K**
Tape $24.95 **Disk $27.95**

KATER PILLAR II **16K**
Tape $24.95 **Disk $27.95**

WAREHOUSE MUTANTS 16K
Tape $24.95 **$Disk $27.95**

NEW

UTILITIES

NOW! You can own the tools we've used to create "Donkey King", "Sailor Man", and others.

We are proud to announce our new utilities for the 64K Disk Color Computer, featuring.......

- **Full** use of 64K RAM
- 100% Machine Language
- Parameters easily changeable in basic loader
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To make life with your disks easier, may we suggest...

MAS — the finest assembler ever written for the Color Computer (includes EDT)..**$74.95 Disk**

EDT — effortless full (51×24) screen editing w/2 way cursor. Disk commands allow easy save/backup/append. Text files to 48K+. Copy, save, move, delete or print blocks. Much more..**$39.95 Disk**

The Deputy Inspector — Alphabetize, re-sort, and backup directory; **fast** 3-swap backups, copy files or programs to same or other disks, can autoreallocate granules during backup for **faster loading,** and more...**$21.95 Disk**

The Sector Inspector — Alphabetize, backup, and printout directory; repair crashes, LLIST basic programs, name disks, read in and edit 23+ grans, 3-swap backups, and more. Has 16-page manual and gran table print program..**$29.95 Disk**

NEW

EDUCATIONAL

FACTPACK

FACTPACK is a set of 3 programs designed for home or school use. The programs provide drill and practice with basic addition, subtraction, multiplication and division facts and are appropriate in grades 1-6. Each program requires a 32K Extended BASIC Color Computer. Disk drive and printer are optional.

Requires 32 K Ext. Basic **Tape $24.95** **Disk $29.95**

TEACHER'S DATABASE II

DISK ONLY
64K Req.

Teachers' Database (TDB) is a program designed to allow a teacher to keep a computerized file of information about his/her students.

The program requires a 64K Color Computer and at least one disk drive. This completely revised program includes all of the capabilities of the original TDB plus many new features.

- Information on as many as 100 students, or more, may be in the computer at one time.
- Each student may have as many as 20, or more, individual items of data in his/her record.
- The program has many easy to follow menus.
- Records may be easily changed, deleted, or combined.
- Information about students may be numerical or text.
- Records may be quickly alphabetized or reordered based on their contents.
- Records may be sored by various criteria.
- A full statistical analysis of scores may be done and sent to the printer.
- Student test scores may be weighted, averaged, changed to a percentage or changed to a letter grade.
- Individual student progress reports and class gradebook sheets may be printed.
- Three methods of data entry spped the task of typing in student grades and test results.
- The program may be easily customized to work with any printer.
- Student seating charts may be created and printed.
- Graphs of student test results may be created using the computer's high resolution graphic screen.
- Grade distribution can be displayed numerically or as a histogram.

NEW

64K TDBII $59.95 • 32K TDB Version - DISK $42.95 TAPE $39.95

VOCABULARY MANAGEMENT

Requires 16K Ext. Basic or 32K for printer output.

The Vocabulary Management System (VMS) is a series of programs designed to aid a parent or teacher in helping children to learn and practice using vocabulary and spelling words. The 11 programs that comprise the VMS include a full feature data entry/edit program, three printer output programs and 5 vocabulary/spelling game programs. The system's many outstanding features include:

- As many as 300 vocabulary words and definitions may be in the computer's memory at one time.
- Words and definitions may be saved on disk or tape.
- Remarks and/or comments can be saved with word files.
- A disk loading menu allows students to load disk files without typing file names.
- Word lists may be quickly alphabetized.
- The three printer segments allow you to create and print individualized tests, puzzles, word-searches and worksheets.
- The printer segments allow full use of your printer's special features.
- The 5 game programs are based on sound educational principles and provide practice in identifying words and matching them with their definitions in a fast-paced set of activities.

TAPE $39.95 **DISK $42.95**

FRACTIONS - A Three Program Package

MIXED & IMPROPER

1. Review converting mixed numerals and improper fractions.
2. Practice converting mixed numerals to improper fractions.
3. Practice converting improper fractions to mixed numerals.
4. Practice of both types. (Mixed to improper & improper to mixed)
5. Review converting mixed numerals to mixed numerals. (Used in regrouping in substraction).
6. Practice converting mixed numerals to mixed numerals.

EQUIVALENCE

1. Definitions of terms and review of finding equivalent fractions.
2. Practice finding equivalent fractions.
3. Practice finding sets of equivalent fractions.
4. Review of dinding if one fraction is equal to, not equal to, less than or greater than another.

LOWEST TERMS

1. Review of placing fractions into lowest terms by dinding the greatest comon factor (GCF) of the numerator and denominator.
2. Practice finding the GCF of pairs of numbers.
3. Practice placing fractions into lowest terms by finding the GCF of the numerator and denominator.

32K EXT BASIC **TAPE $30.95** **DISK $35.95**

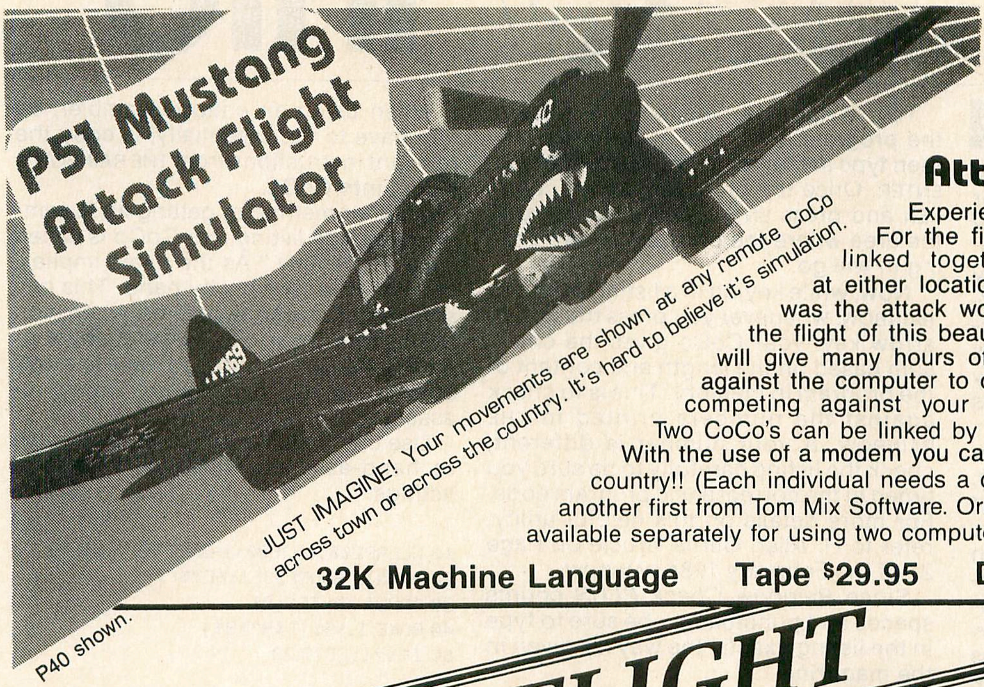
MATH DUEL

MATH DUEL is a challenging mathematics game that pits you against the computer in a game of wits. You must use all of your knowledge of factors, multiples and prime numbers to develop a strategy that allows you tog ather more numbers and thus more points than the computer.

The game is deceptively simple. you select the size of the playing field that is composed of from 8 to 100 numbers. You must then choose numbers that will give you the maximum number of points and the computer the least number of points. There are only 6 rules.

32K EXT. BASIC **TAPE$24.95** **DISK $29.95**

SIMULATIONS


P51 Mustang
Attack Flight
Simulator
JUST IMAGINE! Your movements are shown at any remote CoCo across town or across the country. It's hard to believe it's simulation.
P40 shown.

P51 Mustang Attack Flight Simulator

Experience the ultimate video experience. For the first time ever, two computers can be linked together with action and re-action at at either location, or play alone. The P-51 Mustang was the attack workhorse during WWII. To experience the flight of this beautiful plane in actual combat situation will give many hours of excitement. You can test your skill against the computer to defend your position or try your hand competing against your opponent at any remote location. Two CoCo's can be linked by cable for **TRUE** two-player adventure. With the use of a modem you can test your skill across town or across country!! (Each individual needs a copy of the program.) This program is another first from Tom Mix Software. Order your excitement today. Direct cable available separately for using two computers at the same location.

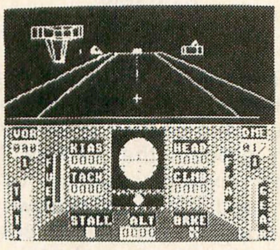
32K Machine Language Tape $29.95 Disk $34.95 Cable $10.95

Worlds of FLIGHT

Jump in the pilot seat - not a game - A realistic Flight Simulation

"World's of Flight is the best out-the-window simulation available for the CoCo". Dr. Scott L. Norman, Hot CoCo, Dec. 1984.

Worlds of Flight (WOF) is a machine language, real-time flight simulation (of a sophisticated ultra-light aircraft). The program is available on DISK but was specifically designed to bring unprecedented detail and power to CASSETTE systems. WOF generates panoramic 3-D views of ground features as the pilot flies within one of nine different "worlds". Instrument flight capability has been provided along with some aerobatic performance. The simulation models over 35 different aircraft and flight performance parameters including winds and cloud ceilings. Sound effects have been faithfully reproduced to provide an even greater sense of realism. A 25 page light manual explains the instrument panel, the basis of flight control, instrument navigation and even walks the pilot through a take off / landing sequence about the airport. Complete with charts bound in an attractive binder, the entire WOF package challenges you to find a more advanced flight simulation for **any computer**... You simply can't! If you are a serious simulation buff this one is for you!



JOYSTICKS REQUIRED

32K MACHINE LANGUAGE

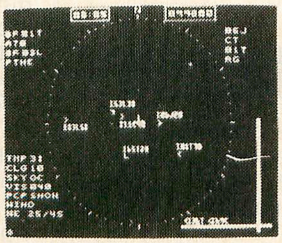
TAPE $29.95

DISK $34.95

NEW!

APPROACH CONTROL SIMULATION

From Betasoft Systems



"Caught in a blinding snowstorm, two jet airliners are on a collision course The pilots are completely unaware of the imminent danger. Hundreds of lives are at stake. A high-speed disaster is inevitable unless you act fast. . ."

This and many other exciting scenarios await you as "Air Traffic Controller" with the APPROACH CONTROL SIMULATION. The thrills, challenges and frustrations you'll experience with this authentic, real-time simulation will lead to countless hours of discovery and adventure.

★ ★ A Complete Simulation Package ★ ★

- **Software on Disk or Tape**
- **Comprehensive Manual**
- **Quick Reference Guide**
- **No Joysticks Required**

32K MACHINE LANGUAGE TAPE $29.95 DISK $34.95

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RAINBOW Info

How To Read Rainbow

Please note that all the BASIC program listings in THE RAINBOW are formatted for a 32-character screen — so they show up just as they do on your CoCo screen. One easy way to check on the accuracy of your typing is to compare what character "goes under" what. If the characters match — and your line endings come out the same — you have a pretty good way of knowing that your typing is accurate.

We also have "key boxes" to show you the *minimum* system a program needs. But, *do* read the text before you start typing.

Finally, the little cassette symbol on the table of contents and at the beginning of articles indicates that the program is available through our RAINBOW ON TAPE service. An order form for this service is on the insert card bound in the magazine.

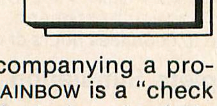
What's A CoCo

CoCo is an affectionate name that was first given to the Tandy Color Computer by its many fans, users and owners.

However, when we use the term CoCo, we refer to both the Tandy Color Computer and the TDP System-100 Computer. It is easier than using both of the "given" names throughout THE RAINBOW.

In most cases, when a specific computer is mentioned, the application is for that specific computer. However, since the TDP System-100 and Tandy Color are, for all purposes, the same computer in a different case, these terms are almost always interchangeable.

The Rainbow Check Plus



The small box accompanying a program listing in THE RAINBOW is a "check sum" system, which is designed to help you type in programs accurately.

Rainbow Check PLUS counts the number and values of characters you type in. You can then compare the number you get to those printed in THE RAINBOW. On longer programs, some benchmark lines are given. When you reach the end of one of those lines with your typing, simply check to see if the numbers match.

To use *Rainbow Check PLUS,* type in the program and `CSAVE` it for later use, then type in the command RUN and press ENTER. Once the program has run, type `NEW` and press ENTER to remove it from the area where the program you're typing in will go.

Now, while keying in a listing from THE RAINBOW, whenever you press the down-arrow key, your CoCo gives the check sum based on the length and content of the program in memory. This is to check against the numbers printed in THE RAINBOW. If your number is different, check the listing carefully to be sure you typed in the correct BASIC program code. For more details on this helpful utility, refer to H. Allen Curtis' article on Page 21 of the February 1984 RAINBOW.

Since *Rainbow Check PLUS* counts spaces and punctuation, be sure to type in the listing exactly the way it's given in the magazine.

```
10 CLS:X=256*PEEK(35)+178
20 CLEAR 25,X-1
30 X=256*PEEK (35)+178
40 FOR Z=X TO X+77
50 READ Y:W=W+Y:PRINT Z,Y;W
60 POKE Z,Y:NEXT
70 IFW=7985THEN80ELSEPRINT
   "DATA ERROR":STOP
80 EXEC X:END
90 DATA 182, 1, 106, 167, 140, 60, 134
100 DATA 126, 183, 1, 106, 190, 1, 107
110 DATA 175, 140, 50, 48, 140, 4, 191
120 DATA 1, 107, 57, 129, 10, 38, 38
130 DATA 52, 22, 79, 158, 25, 230, 129
140 DATA 39, 12, 171, 128, 171, 128
150 DATA 230, 132, 38, 250, 48, 1, 32
160 DATA 240, 183, 2, 222, 48, 140, 14
170 DATA 159, 166, 166, 132, 28, 254
180 DATA 189, 173, 198, 53, 22, 126, 0
190 DATA 0, 135, 255, 134, 40, 55
200 DATA 51, 52, 41, 0
```

Using Machine Language

Machine language programs are one of the features of THE RAINBOW. There are a number of ways to "get" these programs into memory so you can operate them.

The easiest way is by using an editor/assembler, a program you can purchase from a number of sources.

An editor/assembler allows you to enter mnemonics into the CoCo and then have the editor/assembler assemble them into specific instructions that are understood by the 6809 chip, which controls your computer.

When using an editor/assembler, all you have to do, essentially, is copy the relevant instructions from THE RAINBOW'S listing into CoCo.

Another method of getting an assembly language listing into CoCo is called "hand assembly." As the name implies, you do the assembly by hand. This can *sometimes* cause problems when you have to set up an ORIGIN statement or an EQUATE. In short, you have to know something about assembly to hand-assemble some programs.

Use the following program if you wish to hand-assemble machine language listings:

```
10 CLEAR200,&H3F00:I=&H3F80
20 PRINT "ADDRESS:";HEX$(I);
30 INPUT "BYTE";B$
40 POKE I,VAL("&H"+B$)
50 I=I+1:GOTO 20
```

This program assumes you have a 16K CoCo. If you have 32K, change the &H3F00 in Line 10 to &H7F00 and change the value of I to &H7F80.

The Rainbow Seal

RAINBOW
CERTIFICATION
SEAL

The Rainbow Certification Seal is our way of helping you, the consumer. The purpose of the Seal is to certify to you that any product that carries the Seal has been physically seen by us, that it does, indeed, exist and that we have a sample copy here at THE RAINBOW.

Manufacturers of products — hardware, software and firmware — are encouraged by us to submit their products to THE RAINBOW for certification. We ascertain that their products are, in actuality, what they purport to be and, upon such determination, award a Seal.

The Seal, however, is not a "guarantee of satisfaction." The certification process is different from the review process. You are encouraged to read our reviews to determine whether the product is right for your needs.

There is absolutely no relationship between advertising in THE RAINBOW and the certification process. Certification is open and available to any product pertaining to CoCo. A Seal will be awarded to *any* commercial product, regardless of whether the firm advertises or not.

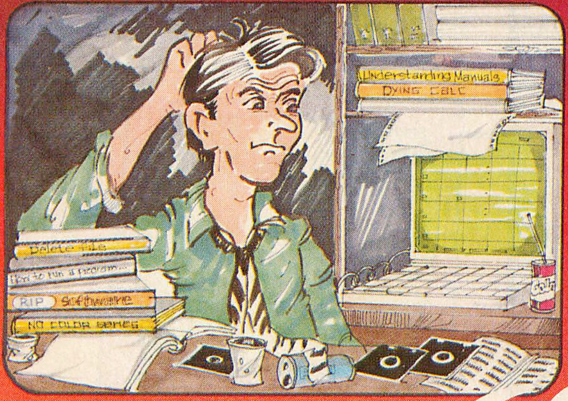
We will appreciate knowing of instances of violation of Seal use.

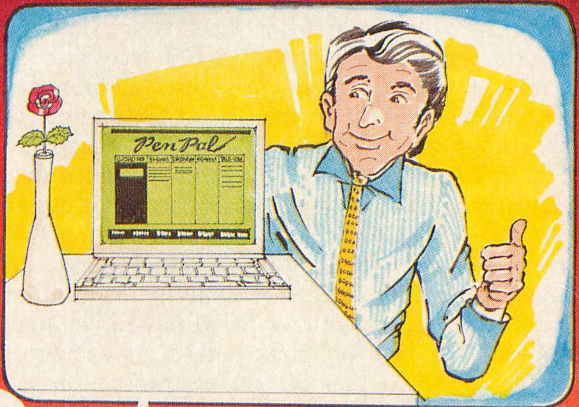
Special Introductory Price*

introducing...

PenPal

The Intelligent Choice...





69.95*
(89.95 CDN)

ADMIT IT! Your computer always had the power, but never the software. Now...Four Star Software presents a product unlike any other. Penpal! This is a package intelligent enough to help you reach new heights of personal productivity. Designed to be learned in less than a day, the entire program is quick and easy, powerful but elegant. A pleasure to use!

Penpal provides you with a package that combines the five most wanted computer applications into one incredibly easy-to-use integrated environment. This sets a new standard of excellence in applications software: What would you pay for a program that does it all, but does it easily?

We invite you to compare PENPAL'S list of outstanding features with any other software currently on the market for any computer! Packages like this cost hundreds more on other machines. PENPAL brings the power of a PC to your CoCo at an Unbelievable and Unbeatable price! We guarantee it...if you are not completely satisfied, return it within 30 days for a prompt refund.

For a limited time, take advantage of our low introductory price. You won't be disappointed you did!

Order your personal copy of PENPAL today to finally realize the full potential of your Color Computer. Available directly from Four Star Software or enquire at your local Computer dealer.

- Twelve function Keys and a continuously displayed reminder line make this program easy to use. No complicated key combinations or commands to remember!
- On-line help function
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An Annual Expense Tracking

This system (set of three programs) allows an individual, or possibly a small business, to maintain and track expenses for one year. A maximum of 135 transactions per month for up to 100 account codes may be tracked by month for an entire year (12 month period). Each expense you wish to track must have a numeric code in the range of 1 through 100 with a description not exceeding 27 characters. The system provides for screen display and printing of data and reports and is designed for use on a 64K CoCo with one disk drive and a DMP-100 printer. In addition to maintaining actual transaction data, the system provides budgetary analysis for accounts over the year. This feature allows for comparative analysis of actual versus budget for an account (display and printout). It should be noted that budget or transaction summary amounts for an account cannot exceed $99,999.99 and a detailed transaction entry for an account cannot be greater than $9,999.99.

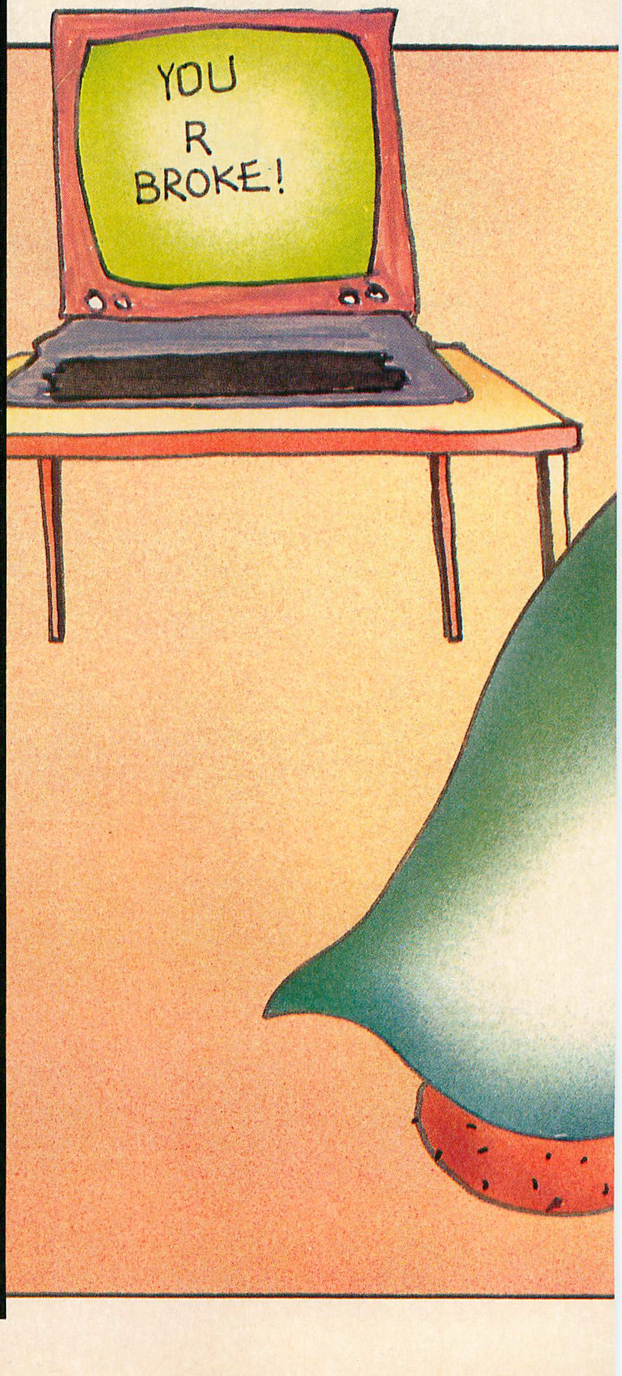
Before proceeding, a discussion of a few basic concepts employed in the design of the system and programs is warranted. The programs feature extensive use of arrays which facilitate fast display of data and fast data entry and maintenance. The disk file access methods are extremely simple and straightforward and, for the most part, use array concepts. This extensive utilization of arrays in the programs yields a system which is both efficient and inefficient, but overall it provides an effective and simple-to-use-and-understand method for tracking expenses.

The design of the system requires that an entire diskette be dedicated for the recording of budgeted and actual expenditures for a year. If you utilize diskette backup for your files and system programs, then two diskettes will be required for one year of data (assuming you have only one backup diskette). Although the system can be used without a printer, one is highly recommended to achieve best results.

As mentioned previously, the system consists of three programs. One program (*Crexpfle*) creates the basic files required for system utilization. The system will not run until this program has been successfully executed. The second program (*Exptrakr*) allows the entry and maintenance of all budget and actual data. It also permits various screen displays of the data (both budget and actual). The third program (*Reptgenr*) prints various listings of budget and actual data. Execution of this program can be independent

---

Eddie Hill is employed as a computer professional. He presently serves in a management capacity. His hobbies include reading, photography and home computing.



and Management System

By Eddie Hill

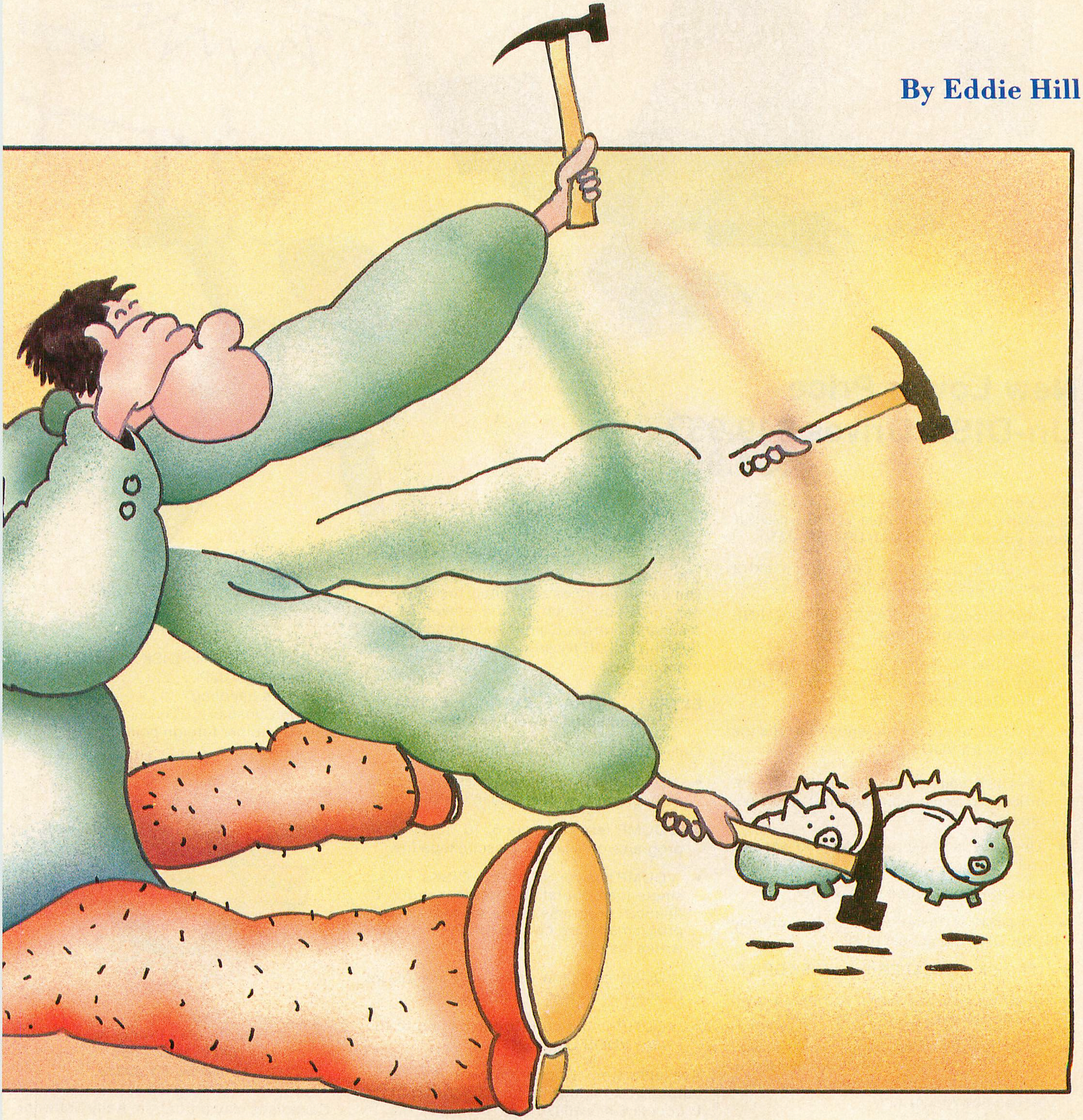


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Exhibit 1

```
                       MONTHLY TRANSACTIONS FOR JANUARY 1986

 REC  ACT                                       TRAN
 NUM  NUM   .....ACCOUNT DESCRIPTION.....  I.D.  DA  ..AMOUNT..  TRANS. DESCRIPTION

   1    1   HOUSE MORTGAGE                  100  31     200.00   PAYMENT
   2    2   INSURANCE                        50  31     100.00   PREMIUM
   3    3   BANK CARDS                      125  31     150.00   PAYMENT
   4    4   ELECTRICITY                     150  31     125.00   BILL
   5    5   AUTO PAYMENT                    110  31     180.00   PAYMENT #10
   6    6   GROCERIES                        90  15     175.00   W.D.
   7    7   CLOTHING                         95  25      80.00   JIM'S
   8    8   MISCELLANEOUS                    98  28      75.00   SOFTWARE
   9    6   GROCERIES                        99  31     245.00   J&D GROCERY
  10    7   CLOTHING                        134  31      30.00   SHOES

                              TOTAL-----------> $  1,360.00
```

of *Exptrakr* or may be selected from the main menu of *Exptrakr.* After execution of *Reptgenr* you may return to *Exptrakr* by exercising the appropriate selection option from the main menu of *Reptgenr.* You may freely transfer between *Exptrakr* and *Reptgenr* or run either as a stand-alone program. It is important that you name the programs "*Exptrakr*" and "*Reptgenr*" because these are the names used in the call routines for the programs.

Both *Exptrakr* and *Reptgenr* are menu driven programs with submenus, instructions and comments as required. This approach offers easy access to (and exits from) routines within the programs. As with all BASIC programs, if you wish to exit a routine before completion, you may hit the BREAK key. Use extreme caution when exercising this option. An entire file or files can be easily "garbaged." Therefore, it is not recommended. You may want to consider a BREAK disable routine in the programs.

Crexpfle

Crexpfle creates the basic files for the system. It merely formats and sizes the following files:

Budget Summary
Transaction Summary
Chart of Accounts
Detail Transaction Filenames

It must be executed before attempting to run *Exptrakr* or *Reptgenr.*

Exptrakr

This program is the heart of the system. It allows for entry and maintenance of all data utilized by the system. This includes charts of accounts, budget and transaction data. *Exptrakr* opens up with a main menu consisting of 14 options. The main menu appears as shown below.

Exhibit 2

```
BUDGET FOR JANUARY 1986

ACT  <--D E S C R I P T I O N-->  ..AMOUNT..

 1   HOUSE MORTGAGE                   200.00
 2   INSURANCE                         50.00
 3   BANK CARDS                       100.00
 4   ELECTRICITY                      150.00
 5   AUTO PAYMENT                     180.00
 6   GROCERIES                        400.00
 7   CLOTHING                         100.00
 8   MISCELLANEOUS                     50.00

                         TOTAL      1,230.00
```

1) Add/change/input budget
2) Account YTD summary trans.
3) Account actual vs. budget
4) Account budget for year
5) Chart of accounts maint.
6) Display chart of accounts
7) Add/chg/del/input trans.
8) Display monthly budget
9) Display monthly trans.
10) Display actual vs. budget
11) Report generator
12) File deletion
13) Backup files
14) End session

A discussion of each option follows.

1) Add/Change/Input Budget
Allows input and maintenance of budget data for an account. You select the month you wish to enter or change by entering the appropriate number for the month (1-12). If you wish to enter or change data for all months, enter "99." You return to the main menu by entering '0'.

2) Account YTD Summary Transaction
A display of a specified account showing summary amounts by month. Pressing ENTER returns you to the main menu.

3) Account Actual vs. Budget
Permits display of summarized actual versus budget amounts for a month or year-to-date through a given month.

4) Account Budget For Year
Displays the yearly budget month by month for an account.

5) Chart of Accounts Maintenance
As stated earlier, each expense you wish to track must have a numeric code in the range 1 through 100 and a description not exceeding 27 characters. The first five positions of the description cannot be "XXXXX" since this denotes to the system that the account has not been established for use. If you inadvertently enter a description with more than 27 characters or "XXXXX" in the first five positions, the system will prompt you to re-enter the description.

This selection gives you three options as follows:

Option 1 — Allows for the entry of account descriptions in numeric order. You are first prompted for the description of Account 1, then Account 2 and so forth until you have entered descriptions for all 100 accounts. If you wish to terminate entry of descriptions at any point before Account 100, merely type `THATS ALL` and press ENTER. The system will automatically return to the main menu just as it does when the description for Account 100 has been entered.

Option 2 — Allows for the addition or changing of account descriptions. The same procedure is used to add or change an account description. A prompt appears that asks for the account number. After entering a valid account number the account number and description will be displayed. You will be asked if this is the account you wish to add or change. If so, type `YES` and press ENTER. If not, type `NO` and ENTER. After entering a changed or added account description you will be asked if you wish to add or change any more account descriptions. The process will repeat as long as you respond "yes." A "no" response will return you to the main menu.

Option 3 — Choosing this option will return you to the main menu.

6) Display Chart of Accounts

Allows for the display of all account numbers with their descriptions (Option 1) or for a single account number with its description (Option 2). If an account description is all X's, it has not been set up for use by the system. Option 3 returns you to the main menu.

7) Add/Chg/Del/Input Transaction

Permits the entry and maintenance of detail transactions (expenses) for a selected month.

Option 1 — This allows the entry of detail expenses for a selected month. You are asked for the number of the month (1-12). The program then checks to see if transactions have already been entered for the month selected. If so, you cannot re-enter the transactions unless you delete the entire month's transaction file (see Selection 12, File deletion, for instructions). If transactions for the month you wish to enter are not on file, the program allows you to continue and prompts you through entry of your expenses. Please notice the program assigns each entry a record number which will be used for changing or deleting transactions, if necessary, in the future. Each addition to a month's transaction must be assigned a record number. This must be an

Exhibit 3

```
---------------------------------------------------------------------------------
                                       JAN          FEB          MAR          APR
                                       MAY          JUN          JUL          AUG
BUDGET FOR  1986                       SEP          OCT          NOV          DEC
---------------------------------------------------------------------------------
HOUSE MORTGAGE                      200.00       200.00       200.00       200.00
                                    200.00       200.00       200.00       200.00
  1  TOTAL..$  2,400.00             200.00       200.00       200.00       200.00

INSURANCE                            50.00        50.00        50.00        50.00
                                     50.00        50.00        50.00        50.00
  2  TOTAL..$    600.00              50.00        50.00        50.00        50.00

BANK CARDS                          100.00       100.00       100.00       100.00
                                    100.00       100.00       100.00       100.00
  3  TOTAL..$  1,200.00             100.00       100.00       100.00       100.00

ELECTRICITY                         150.00       150.00       150.00       150.00
                                    150.00       150.00       150.00       150.00
  4  TOTAL..$  1,800.00             150.00       150.00       150.00       150.00

AUTO PAYMENT                        180.00       180.00       180.00       180.00
                                    180.00       180.00       180.00       180.00
  5  TOTAL..$  2,160.00             180.00       180.00       180.00       180.00

GROCERIES                           400.00       400.00       400.00       400.00
                                    400.00       400.00       400.00       400.00
  6  TOTAL..$  4,800.00             400.00       400.00       400.00       400.00

CLOTHING                            100.00       100.00       100.00       100.00
                                    100.00       100.00       100.00       100.00
  7  TOTAL..$  1,200.00             100.00       100.00       100.00       100.00

MISCELLANEOUS                        50.00        50.00        50.00        50.00
                                     50.00        50.00        50.00        50.00
  8  TOTAL..$    600.00              50.00        50.00        50.00        50.00

TOTAL BUDGET FOR YEAR             1,230.00     1,230.00     1,230.00     1,230.00
                                  1,230.00     1,230.00     1,230.00     1,230.00
999  TOTAL..$ 14,760.00           1,230.00     1,230.00     1,230.00     1,230.00
```

Exhibit 4

```
---------------------------------------------------------------------------
                                    JAN         FEB         MAR         APR
                                    MAY         JUN         JUL         AUG
ACTUAL FOR  1986                    SEP         OCT         NOV         DEC
---------------------------------------------------------------------------
HOUSE MORTGAGE                   200.00        0.00        0.00        0.00
                                   0.00        0.00        0.00        0.00
  1  TOTAL..$      200.00          0.00        0.00        0.00        0.00

INSURANCE                        100.00        0.00        0.00        0.00
                                   0.00        0.00        0.00        0.00
  2  TOTAL..$      100.00          0.00        0.00        0.00        0.00

BANK CARDS                       150.00        0.00        0.00        0.00
                                   0.00        0.00        0.00        0.00
  3  TOTAL..$      150.00          0.00        0.00        0.00        0.00

ELECTRICITY                      125.00        0.00        0.00        0.00
                                   0.00        0.00        0.00        0.00
  4  TOTAL..$      125.00          0.00        0.00        0.00        0.00

AUTO PAYMENT                     180.00        0.00        0.00        0.00
                                   0.00        0.00        0.00        0.00
  5  TOTAL..$      180.00          0.00        0.00        0.00        0.00

GROCERIES                        420.00        0.00        0.00        0.00
                                   0.00        0.00        0.00        0.00
  6  TOTAL..$      420.00          0.00        0.00        0.00        0.00

CLOTHING                         110.00        0.00        0.00        0.00
                                   0.00        0.00        0.00        0.00
  7  TOTAL..$      110.00          0.00        0.00        0.00        0.00

MISCELLANEOUS                     75.00        0.00        0.00        0.00
                                   0.00        0.00        0.00        0.00
  8  TOTAL..$       75.00          0.00        0.00        0.00        0.00

TOTAL ACTUAL FOR YEAR          1,360.00        0.00        0.00        0.00
                                   0.00        0.00        0.00        0.00
999  TOTAL..$    1,360.00          0.00        0.00        0.00        0.00
```

unused number in the range 1-100. More on changes, deletions and additions later.

The entry of detail transactions requires a valid account number for each transaction. Therefore, you must set your chart of accounts file up prior to using this option. Other information you must enter is as follows:

Date — This is the day the transaction occurred.

Trans. I.D. — A one- to four-digit identifying tag (e.g., check number). May be alphabetic or numeric.

Amount — The amount of the transaction (not to exceed $9,999.99) may be debit or credit.

Description — This is an optional identification, not exceeding 14 characters, for the transaction (e.g., monthly payment).

When the entry of the detail transaction is complete, press ENTER. This writes the transaction to the file and returns to a fresh transaction entry screen for input of the next transaction. Upon completing the entry of all detail transactions for the month, enter "ZZZ" in the account number field and press ENTER. This will complete the writing of the transaction file and post transaction summary totals for the month. After this is complete you are returned to the data entry submenu.

Option 2 — Allows the entering of new information for a transaction which has already been entered. You must specify the month and the record number of the transaction (shown on detail printout of month's transactions) you wish to change. A check is made to ensure that you have entered a correct record number. If the record number is valid, the transaction is displayed. Next, you are asked if it is the one you wish to change. If so, all

Exhibit 5

```
TRANSACTION SUMMARY FOR 1986 ....A/0 01/31/86

ACT  ....ACCOUNT DESCRIPTION....   ...AMOUNT...

  1  HOUSE MORTGAGE                      200.00
  2  INSURANCE                           100.00
  3  BANK CARDS                          150.00
  4  ELECTRICITY                         125.00
  5  AUTO PAYMENT                        180.00
  6  GROCERIES                           420.00
  7  CLOTHING                            110.00
  8  MISCELLANEOUS                        75.00

                                TOTAL  $  1,360.00
```

Exhibit 6

```
ACTUAL VS. BUDGET FOR JANUARY 1986

ACT  ...D E S C R I P T I O N...    ...ACTUAL..    ...BUDGET..    ..VARIANCE.

  1  HOUSE MORTGAGE                     200.00         200.00          0.00
  2  INSURANCE                          100.00          50.00         50.00-
  3  BANK CARDS                         150.00         100.00         50.00-
  4  ELECTRICITY                        125.00         150.00         25.00
  5  AUTO PAYMENT                       180.00         180.00          0.00
  6  GROCERIES                          420.00         400.00         20.00-
  7  CLOTHING                           110.00         100.00         10.00-
  8  MISCELLANEOUS                       75.00          50.00         25.00-

                    TOTAL ---->    $  1,360.00    $  1,230.00    $    130.00-
```

Exhibit 7

```
YEAR TO DATE A/O JANUARY 1986

ACT  ...D E S C R I P T I O N...    ...ACTUAL..    ...BUDGET..    ..VARIANCE.

  1  HOUSE MORTGAGE                     200.00         200.00          0.00
  2  INSURANCE                          100.00          50.00         50.00-
  3  BANK CARDS                         150.00         100.00         50.00-
  4  ELECTRICITY                        125.00         150.00         25.00
  5  AUTO PAYMENT                       180.00         180.00          0.00
  6  GROCERIES                          420.00         400.00         20.00-
  7  CLOTHING                           110.00         100.00         10.00-
  8  MISCELLANEOUS                       75.00          50.00         25.00-

                    TOTAL ---->    $  1,360.00    $  1,230.00    $    130.00-
```

of the data must be re-entered for the transaction (just as if it were new). Upon completion of entry of the new data for the transaction, press ENTER. This records the transaction on the file and asks if you wish to change more transactions. If you answer 'Y' then the process repeats, else the transaction summary file is updated and you are returned to the data entry submenu.

Option 3 — This option will add new transactions (e.g., overlooked, not available at time data for month was entered) to a month's file. You must specify the record number for the record to be added. This may be derived by looking at a detail printout for the month and adding one to the record number shown for the last transaction. The program will not permit the addition of a transaction with an existing record number, as it checks this before allowing you to proceed. Once it is determined that you are not trying to add a duplicate record, you are presented with the data entry screen. The procedure from this point is the same as for entering change data in Option 2 of this selection. Instead of referring to transaction changes, the prompts relate to transaction additions.

Option 4 — Allows you to delete a transaction from a month's file (e.g., a transaction was included in the wrong month). Again you must work with a record number, which may be obtained from the printout of the detail transactions for the month. You are asked for the deletion record number, then the program checks to see if it is valid. If so, it displays the record for a visual verification. You are asked if this is the record you wish to delete. A response of 'N' prompts you for another record number while a 'Y' response deletes the record and updates the appropriate files. The steps from this point follow the same logic as options 2 and 3 in this selection, except comments that relate to deletions.

Option 5 — Returns to the main menu. It should be noted that options 1 through 4 for this selection allow for submenu return in case you chose an option in error.

8) Display Monthly Budget
Displays budgeted account expenditures for a selected month.

9) Display Monthly Transaction
Displays the summary amount of each account's transactions for a selected month.

10) Display Actual vs. Budget
You have the choice of choosing a specific month or year-to-date through a specific month. The submenu will guide you.

11) Report Generator
This selection allows you to print out reports from the data you have entered. This is a separate program (*Reptgenr*, program Listing 3) and is called from this menu choice. You are given seven print selections plus a selection to return to the main program (*Exptrakr*) or to terminate the session. Details on this selection are covered in the comments on program Listing 3.

12) File Deletion
This selection allows you to delete either a budget or transaction file for a specified month. The appropriate transactions summaries are adjusted. After completion of

this option, data for a given month (budget or transaction) may be re-entered.

13) Backup Files
The method used is the single disk copy procedure provided for but not documented in the Radio Shack manuals. I recommend at least a two-generation backup system (backup of current files, plus prior generation).

14) End Session
Choose this option when you are ready to end the program (*Exptrakr*). Remember to backup your files.

Reptgenr

This program provides for various listings of your data. A discussion of the selections follows:

1) List Monthly Transactions
This selection gives you a listing of all the transactions for a specified month. The listing is the only place where this detail is given. Record numbers are obtained from this listing. See Exhibit 1.

2) List Monthly Budget
This option provides a listing of the budget amounts for each account with budgeted expenditures in a specified month. See Exhibit 2.

3) List Budget For Year
Provides a month-by-month listing of each account's budgeted amounts for the year. See Exhibit 3.

4) List Actual For Year
Provides a month-by-month listing of each account's actual amounts for the year. See Exhibit 4.

5) List Transaction Summary For Year
Provides a summarized listing of all account amounts entered. See Exhibit 5.

6) List Month Actual vs. Budget
Provides a summarized listing of account versus budget amounts for a chosen month. A difference (variance) between actual and budget is shown. Credit (-) amounts in the variance column are unfavorable (over budget) while debit variances are favorable (under budget). See Exhibit 6.

Exhibit 8

```
ACT  <--D E S C R I P T I O N-->

  1  HOUSE MORTGAGE
  2  INSURANCE
  3  BANK CARDS
  4  ELECTRICITY
  5  AUTO PAYMENT
  6  GROCERIES
  7  CLOTHING
  8  MISCELLANEOUS
```

7) List YTD Actual vs. Budget
Provides the same information as Selection 5, except it reflects data through a specified month. See Exhibit 7.

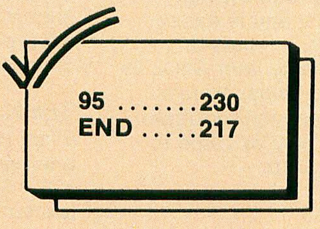
8) List Chart of Accounts
Allows for a listing of your chart of accounts. This is a handy reference listing. See Exhibit 8.

9) Return to Main Program
This option returns you to the main program, *Exptrakr*, to continue other activities.

10) End Session
Select this option if you wish to terminate the program.

Although this set of programs offers various options for use in budgeting and tracking expenses, enhancements such as displaying all account detail expenditures for a year or allowing for more transactions in a month can be made. It is hoped that the programs are helpful and create an interest in expanding their usefulness. May all of your expenditures be small.

(Any questions relating to these programs may be directed to Eddie Hill at 124 Sterling Drive, Hueytown, AL 35023; phone 205-491-1452. Please include an SASE when writing.) ☐



Listing 1: CREXPFLE

```
0 CLS:PRINT"CREATE FILES FOR EXP
ENSE        TRACKING AND MANAGEM
ENT":PRINT:PRINT"AUGUST 1985":PR
INT:PRINT STRING$(32,"-");:PRINT
"EDDIE HILL":PRINT"124 STERLING
DRIVE":PRINT"HUEYTOWN, AL 35023"
:PRINT"(205) 491-1452"
2 PRINT STRING$(32,"-"):PRINT"RE
QUIREMENTS:":PRINT:PRINT"64K COC
O DISK BASIC 1.1":PRINT"DISK DRI
VE";:FORI=1TO9999:NEXTI
5 CLS:PRINT@128,"ENTER YEAR - 19
XX. ";:INPUTYEAR
7 IF YEAR <1986 THEN 5
8 CLS:PRINT@128,"I AM FORMATTING
 THE BUDGET FILE FOR";YEAR
10 OPEN "D",#1,"BUDGET/DAT",128
20 FOR I=1TO100
25 WRITE #1,YEAR
30 FOR X=1TO12
40 WRITE #1,00000.00
50 NEXTX
60 PUT #1,I
70 NEXTI
80 CLOSE #1
85 CLS:PRINT@128,"I AM FORMATTIN
G THE CHART OF    ACCOUNTS FILE
FOR";YEAR
90 OPEN "D",#1,"CHRTACCT/DAT",30
95 FORI=1TO100
100 WRITE #1,"XXXXXXXXXXXXXXXXX
XXXXXXXXX"
110 PUT #1,I
120 NEXTI
130 CLOSE#1
135 CLS:PRINT@128,"I AM FORMATTI
NG THE TRANSACTION FILE FOR";YEA
R
140 OPEN "D",#1,"TRANSFLE/DAT",1
```

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ENTER
CLEAR
SHIFT
BREAK

To achieve maximum productivity with your Color Computer, you have to make it as easy as possible to get information into and out of the system.

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```
28
150 FORI=1TO100
152 WRITE #1,YEAR
155 FORX=1TO12
160 WRITE #1,00000.00
170 NEXTX
180 PUT #1,I
190 NEXTI
200 CLOSE #1
210 CLS:PRINT@128,"I AM FORMATTI
NG THE DETAIL        TRANSACTION F
ILENAME FILE FOR  ";YEAR
220 OPEN "D",#1,"FILENAME/DAT",2
1
230 FORI=1TO12
240 WRITE #1,YEAR,"ZZZZZZZZ/ZZZ"
250 PUT #1,I
260 NEXT I
270 CLOSE #1
275 CLS:PRINT@128,"I HAVE FINISH
ED.FORMATTING THE  FILES FOR THE
 EXPENSE TRACKING  AND MANAGEMEN
T PROGRAMS. YOU MAYNOW USE THE P
ROGRAMS.":PRINT
280 END
```

40	146	5320	195
208	248	5526	230
420	136	5580	7
736	196	5760	1
940	128	5950	189
2440	85	7036	244
3020	69	8990	220
3230	185	9031	111
4022	177	10002	30
4540	129	11800	193
5002	179	11960	172
5025	242	11986	171
5057	187	12015	48
5145	137	END	84

Listing 2: EXPTRAKR

```
 0 PCLEAR1
 5 CLS0
 6 PRINT" EXPENSE TRACKING & MANA
GEMENT"
 12 PRINT@64,STRING$(32,"$");:PRI
NT"           author
   ";:PRINT"              EDDIE HIL
L":PRINT"     124 STERLING DRI
VE":PRINT"      HUEYTOWN, AL 35
023":PRINT"          (205)491-145
2":PRINT STRING$(32,"$");:
 15 PRINT"          requirements
        ";:PRINT"    64K COCO D
ISK BASIC 1.1":PRINT"
DISK DRIVE":PRINT"          DMP 10
0 PRINTER":PRINTSTRING$(32,"$");
:
19 PRINT@481,"PART I===========
=AUGUST 1985";:
20 P=64:FORI=1TO12:PRINT@P,"$";:
PRINT@P+31,"$";:P=P+32:NEXTI:FOR
X=1TO9999:NEXTX
21 DATA "JANUARY","FEBRUARY","MA
RCH","APRIL","MAY","JUNE","JULY"
,"AUGUST","SEPTEMBER","OCTOBER",
"NOVEMBER","DECEMBER"
29 CLEAR3000
30 FILES 3:DIM BAMT(12),TAMT(12)
,VAR(12),MO$(12),FL$(12),TTOT(10
0),DA$(100),CTOT(100),YTOT(100)
40 FORI=1TO12:READMO$(I):NEXTI:R
ESTORE
45 CLS:GOTO165
160 CLS:PRINT@134,"ONE MOMENT PL
EASE.":DLSW=0:FOR I=1TO100:DA$(I
)="":CTOT(I)=0:TTOT(I)=0:YTOT(I)
=0:NEXTI:CLS
165 PRINT@0,"********* SELECTION
S **********"
180 PRINT" 1) ADD/CHANGE/INPUT B
UDGET"
190 PRINT" 2) ACCOUNT YTD SUMMAR
Y TRANS."
200 PRINT" 3) ACCOUNT ACTUAL VS.
 BUDGET"
201 PRINT" 4) ACCOUNT BUDGET FOR
 YEAR"
202 PRINT" 5) CHART OF ACCOUNTS
MAINT."
203 PRINT" 6) DISPLAY CHART OF A
CCOUNTS"
204 PRINT" 7) ADD/CHG/DEL/INPUT
TRANS."
205 PRINT" 8) DISPLAY MONTHLY BU
DGET"
206 PRINT" 9) DISPLAY MONTHLY TR
ANS."
207 PRINT"10) DISPLAY ACTUAL VS.
 BUDGET"
208 PRINT"11) REPORT GENERATOR"
209 PRINT"12) FILE DELETION"
210 PRINT"13) BACKUP FILES"
219 PRINT"14) END SESSION"
220 PRINT"  ";:INPUTA
250 ON A GOSUB 360,2210,3000,600
0,4000,10000,5000,7000,8000,8990
,11000,12000,13000,18000
260 GOTO160
360 CLS:PRINT@192,"ENTER BUDGET
ACCOUNT NUMBER";:INPUTACNO:IFACN
O>100 OR ACNO<1 THEN 360 ELSE I=
ACNO
```

```
365 CLS:PRINT@192,"I AM LOADING
BUDGET ACCOUNT ";ACNO;"."
370 OPEN "D",#1,"BUDGET/DAT",128
380 OPEN "D",#2,"CHRTACCT/DAT",3
0
390 GET #2,I:INPUT #2,DESC$:CLOS
E #2
395 IF MID$(DESC$,1,5)="XXXXX"TH
EN400ELSE410
400 PRINT:PRINT"THE ABOVE ACCOUN
T DOES NOT HAVE A DESCRIPTION. I
F YOU NEED TO  USE IT YOU MUST
ADD IT TO THE   CHART OF ACCOUNT
S. I AM GOING   BACK TO THE MAIN
 MENU.":CLOSE#1:FOR T=1 TO 6000:
NEXT T:GOTO160
410 GET #1,I
415 INPUT #1,YEAR
420 FOR I=1TO12
430 INPUT #1,BAMT(I)
460 NEXTI
465 CLOSE #1
470 CLS
607 PRINT DESC$
610 PRINT YEAR;"        BUDGET AMO
UNT"
620 SUMBUD=0
630 FOR I=1 TO 12
640 PRINT USING"%           %%
%#####.##-";MO$(I);SPACE$;BAMT(I
)
650 SUMBUD=SUMBUD+BAMT(I)
660 NEXTI
670 PRINT@80,USING"$#####.##-";B
AMT(1)
675 IF RC=1 THEN 910
680 PRINT@448,USING"%
   %$#####.##-";" TOTAL    ";SUMB
UD
685 IFBSW=1THEN6010
690 PRINT@480,"1-12=MO : 99=ALL
: 0=MENU :";:INPUTAN
710 IFAN=0THEN790
712 IF AN=99 THEN 720
713 IF AN <1 OR AN >12 THEN 690
720 CLS
730 N=AN
736 PRINT
745 PRINT
750 PRINT DESC$
755 IF AN=99 THEN 900
756 PRINT
760 PRINTUSING "%           %$#
####.##-";MO$(N);BAMT(N)
770 PRINT:INPUT"  NEW AMOUNT";BA
MT(N)
780 GOTO470
790 CLS:PRINT@128,"I AM WRITING
BUDGET ACCOUNT ";ACNO;"."
```

```
800 OPEN "D",#1,"BUDGET/DAT",128
805 WRITE #1,YEAR
810 FOR I=1TO12
820 WRITE #1,BAMT(I)
830 NEXTI
840 PUT #1,ACNO
880 CLOSE #1
890 RETURN
900 RC=1:GOTO470
910 '
912 PP=80
915 FORI=1TO12
917 PRINT@PP,USING"%            %"
;STRING$(10," ")
920 PRINT@PP,"";:INPUTBAMT(I)
930 PRINT@PP,USING"$#####.##-";B
AMT(I)
940 PP=PP+32
950 NEXTI:RC=0:GOTO470
2210 CLS:PRINT@128,"ENTER TRANS.
 ACCOUNT NUMBER";:INPUTACNO:IFAC
NO>100 OR ACNO<1 THEN 2210 ELSE
I=ACNO
2220 CLS:PRINT@128,"I AM LOADING
 TRANS. ACCOUNT ";ACNO;"."
2230 OPEN "D",#1,"TRANSFLE/DAT",
128
2240 OPEN "D",#2,"CHRTACCT/DAT",
30
2250 GET #2,I:INPUT #2,DESC$:CLO
SE #2
2260 GET #1,I
2265 N=I
2270 INPUT #1,YEAR
2280 FOR I=1TO12
2290 INPUT #1,TAMT(I)
2300 NEXTI
2310 CLOSE #1
2320 CLS
2360 PRINTDESC$
2380 PRINT YEAR;"        TRANS. AM
OUNT"
2400 TRNBAL=0
2410 FOR I=1 TO 12
2420 PRINT USING"%           %%
 %#####.##-";MO$(I);SPACE$;TAMT(
I)
2430 TRNBAL=TRNBAL+TAMT(I)
2440 NEXTI
2450 PRINT@80,USING"$#####.##-";
TAMT(1)
2460 IF RC=1 THEN 2710
2470 PRINT@448,USING"%
   %$#####.##-";" TOTAL    ";TRN
BAL
2480 PRINT@480,"<ENTER> FOR MAIN
 MENU.";:I$=INKEY$:IFI$<> CHR$(1
3) THEN 2480 ELSE 160
2610 CLS:PRINT@410,"I AM REWRITI
```

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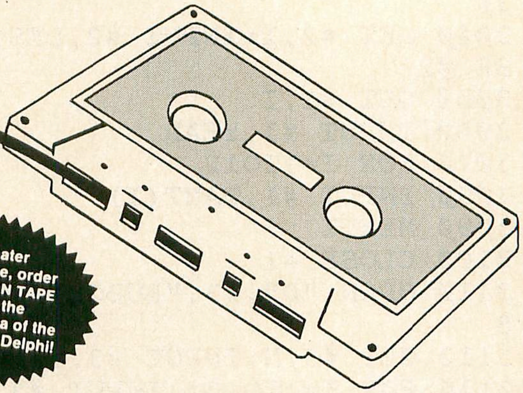

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```
NG TRANSACTION ACCOUNT ";ACNO;".
"
2620 OPEN "D",#1,"TRANSFLE/DAT",
128
2630 WRITE #1,YEAR
2640 FOR I=1TO12
2650 WRITE #1,TAMT(I)
2660 NEXTI
2670 PUT #1,ACNO
2680 CLOSE #1
2690 RETURN
3000 CLS:PRINT@128,"ENTER ACCOUN
T NUMBER";:INPUTACNO:IFACNO>100
OR ACNO<1 THEN 3000 ELSE I=ACNO
3010 CLS:PRINT@128,"I AM LOADING
 ACCOUNT ";ACNO;"."
3015 N=I
3020 OPEN "D",#1,"TRANSFLE/DAT",
128
3030 OPEN "D",#2,"CHRTACCT/DAT",
30
3040 GET #2,I:INPUT #2,DESC$:CLO
SE #2
3050 GET #1,I
3060 INPUT #1,YEAR
3070 FOR I=1TO12
3080 INPUT #1,TAMT(I)
3090 NEXTI
3100 CLOSE #1
3110 OPEN "D",#3,"BUDGET/DAT",12
8
3112 GET #3,N:INPUT #3,YEAR
3115 FOR I=1TO12: INPUT #3,BAMT(
I):NEXTI
3118 CLOSE #3
3119 CLS
3150 PRINTDESC$
3170 PRINT YEAR;" ACTUAL       BU
DGET"
3190 TRNBAL=0
3195 SUMBAL=0:VARTOT=0
3200 FOR I=1 TO 12
3205 VAR(I)=TAMT(I)-BAMT(I)
3210 PRINT USING"% %% %####.##-%
 %#####.##-";MO$(I);SPACE$;TAMT(
I);"    ";BAMT(I)
3220 TRNBAL=TRNBAL+TAMT(I)
3225 SUMBUD=SUMBUD+BAMT(I)
3227 VARTOT=VARTOT+VAR(I)
3230 NEXTI
3240 PRINT@68,USING"$#####.##-%%
$#####.##-";TAMT(1);"";BAMT(1)
3250 IF RC=1 THEN 3500
3260 PRINT@448,USING"%  %$#####.
##-%%$#####.##-";"TOT      ";TRNBA
L;"";SUMBUD
3270 PRINT@480,"<ENTER> FOR MAIN
 MENU.";:
3275 I$=INKEY$:IFI$ <> CHR$(13)
THEN 3275
3280 GOTO160
4000 CLS:PRINT"***********SELECT
IONS***********":PRINT"1) ENTER
ACCOUNT DESCRIPTIONS":PRINT:PRIN
T"2) ADD/CHG ACCOUNT DESCRIPTION
":PRINT:PRINT"3) RETURN TO MAIN
MENU":PRINT:PRINT:PRINT" ";:INPU
TA:ON A GOSUB 4010,4500,160:GOTO
4000
4010 CLS:OPEN "D",#1,"CHRTACCT/D
AT",30:PRINT"ACT <--D E S C R I
P T I O N-->":PRINT:FOR X=1TO100
 STEP 10:PP=64:FORI=X TO X+9:PRI
NTUSING"###";I:IFRC=1THEN4050
4020 PRINT@480,"<THATS ALL> FOR
MAIN MENU.";:PRINT@PP+4,"";:LINE
 INPUT DC$
4021 L=LEN(DC$):IF L>27 OR LEFT$
(DC$,5)="XXXXX" THEN 4020
4022 IF DC$="THATS ALL" THEN 404
0
4025 WRITE #1,DC$:PUT #1,I
4028 PP=PP+32:NEXTI
4029 IF RC <> 1 THEN 4030 ELSE P
RINT@416,"<ENTER> TO CONTINUE OR
 'R' FOR  RETURN TO MAIN MENU.";
:INPUTA$:IFA$=CHR$(13) THEN 4030
 ELSE IF A$="R" THEN 4040
4030 PP=64:FORN=1TO10:PRINT@PP:P
P=PP+32:NEXTN:PRINT@64,"";:
4031 NEXTX
4040 RC=0:CLOSE #1:GOTO160
4050 GET #1,I:INPUT #1,DESC$:PRI
NT@PP+4,"";DESC$:GOTO4028
4500 CLS:OPEN "D",#1,"CHRTACCT/D
AT",30
4510 CLS:PRINT@128,"ENTER ACCOUN
T NUMBER YOU WISH  TO ADD OR CH
ANGE";:INPUTAC:IFAC <1 OR AC>100
 THEN 4510
4520 CLS:PRINT@128,"I AM LOADING
 ACCOUNT ";AC:GET #1,AC:INPUT #1
,DESC$:CLOSE#1:CLS:PRINT@128,"CU
RRENT DESCRIPTION ACCOUNT ";AC;:
PRINT:PRINTDESC$:IFRC=1THEN10530
4530 PRINT@256,"IF YOU WISH TO R
ETURN TO MAIN   MENU THEN ENTER
<RET> OTHERWISE ANSWER YES OR NO
. IS THIS THE   ACCOUNT YOU WISH
 TO ADD OR      CHANGE";:INPUTA$
:IF A$="YES" THEN 4540 ELSE IF A
$="NO" THEN 4500 ELSE IF A$="RET
" THEN 160 ELSE 4530
4540 CLS:PRINT@128,"";:PRINT"NEW
 DESCRIPTION ACCOUNT ";AC:PRINT:
PRINT"";:LINE INPUT DC$
4549 DSC$=LEFT$(DC$,5)
4550 L=LEN(DC$):IF L>27 OR LEFT$
```

```
(DC$,5)="XXXXX" THEN 4540
4555 CLS:PRINT@128,"I AM REWRITI
NG THE CHART OF      ACCOUNTS FIL
E.";:
4560 OPEN "D",#1,"CHRTACCT/DAT",
30:WRITE #1,DC$:PUT #1,AC:CLOSE
#1
4562 CLS:PRINT@128,"DO YOU WISH
TO ADD OR CHANGE     MORE ACCOUNT
S";:INPUTA$:IFA$ ="YES" THEN 450
0 ELSE IF A$="NO" THEN 160 ELSE
4562
4570 GOTO 160
5000 ISW=0:CSW=0:DSW=0:SW=0:CLS:
PRINT"*********SELECTIONS******
*****":PRINT:PRINT"1) ENTER NEW
TRANSACTIONS":PRINT"2) CHANGE A
TRANSACTION":PRINT"3) ADD A TRAN
SACTION":PRINT"4) DELETE A TRANS
ACTION":
5002 PRINT"5) RETURN TO MAIN MEN
U":PRINT:PRINT" ";:INPUTA:ON A G
OSUB 5005,5500,5700,5900,160:GOT
O5000
5005 CLS:PRINT@128,"I AM LOADING
 THE NAMES OF       EXISTING TRA
NSACTION FILES.";:OPEN "D",#1,"F
ILENAME/DAT",21:FORI=1TO12:GET #
1,I:INPUT #1,YEAR,FLE$:FL$(I)=FL
E$:NEXTI:CLOSE #1
5009 IFDSW=1THEN5015ELSE5010
5010 IFISW=1THEN5015ELSEIFCSW=1T
HEN5015ELSEIFRC=10THEN5015ELSECL
S:PRINT"ENTER NEW MONTH TRANSACT
IONS":PRINT:PRINT"WHICH MONTH'S
DO YOU WISH TO     ENTER (1-12 OR
 99 TO RETURN TO  THE MAIN MENU)
";:INPUTMO:IF MO=99 THEN 160 ELS
E IF MO<01 OR MO>12 THEN 5010
5015 AP$=LEFT$(MO$(MO),3):FLE$="
DTLTRANS/"+AP$:IF FL$(MO)=FLE$ T
HEN 5020 ELSE IF FL$(MO)="ZZZZZZ
ZZ/ZZZ" THEN 5023
5020 IFDSW=1THEN5920ELSEIFISW=1T
HEN5720ELSEIFCSW=1THEN5520ELSEPR
INT:IFRC=10THEN11125ELSEPRINT"TR
ANSACTIONS FOR THIS MONTH     AL
READY ENTERED. PLEASE ENTER A DI
FFERENT MONTH.";:FORX=1TO3000:NE
XTX:GOTO5010
5023 IFCSW=1 OR ISW=1THEN5550
5025 IFRC=10THEN11120ELSE FL$(MO
)=FLE$:CLS:PRINT@128,"I AM REWRI
TING NAMES OF          TRANSACTIO
N FILES TO INCLUDE THEMONTH FOR
WHICH YOU ARE ENTERINGTRANSACTIO
NS.";:OPEN "D",#1,"FILENAME/DAT"
,21:FORI=1TO12:WRITE #1,YEAR,FL$
(I):PUT #1,I:NEXTI:CLOSE#1
```

```
5030 OPEN "D",#1,FLE$,51:OPEN "D
",#2,"CHRTACCT/DAT",30:GOSUB5400
5031 FORN=1TO135:CLS:PRINT"TRANS
ACTIONS FOR ";MO$(MO);",";YEAR:G
OSUB5200
5035 PRINT@32,STRING$(32,CHR$(12
8))
5045 PRINT@64,"TRANSACTION ";:PR
INT USING "##";N:
5050 PRINT@128,"ACCOUNT....  ";:
LINE INPUT ACNO$:IF ACNO$="ZZZ"T
HEN 5210 ELSE ACNO=VAL(ACNO$):IF
ACNO <1 OR ACNO >100 THEN5050
5055 IF MID$(DA$(ACNO),1,5)="XXX
XX" THEN 5056 ELSE 5060
5056 PRINT:PRINT"THE ABOVE ACCOU
NT IS INVALID.   ENTER <99> FOR
RETURN TO MAIN   MENU, OTHERWISE
 HIT <ENTER> TO  RE-ENTER CORREC
T ACCOUNT NUMBER.":PRINT;:INPUT
RT:IFRT=99THEN5058
5057 PRINT@128,STRING$(255," "):
GOTO5050
5058 CLOSE#1:CLOSE#2:GOTO5220
5060 PRINT" ";DA$(ACNO)
5065 PRINT"IS THIS THE CORRECT A
CCOUNT";:
5066 A$=INKEY$:IFA$=""THEN5066
5067 IFA$="Y"THEN5070ELSEIFA$<>"
N"THEN5066
5068 PRINT@128,STRING$(128," "):
GOTO5050
5070 PRINT@192,STRING$(64," "):P
RINT@224,"DATE(DA)...  ";:LINEIN
PUTDT$:DA=VAL(DT$):IFDA<1ORDA>31
THEN5070
5090 PRINT@256,STRING$(64," "):P
RINT@256,"TRANS. ID..  ";:LINEIN
PUTCHK$:CHK=VAL(CHK$):IFCHK<1ORC
HK>9999THEN5090
5110 PRINT@288,STRING$(64," "):P
RINT@288,"AMOUNT....   ";:LINEIN
PUTAMT$:AMT=VAL(AMT$):A=ABS(AMT)
:IFA<10000THEN5120ELSE5110
5120 PRINT@301,USING"##,###.##-"
;AMT
5125 TTOT(ACNO)=TTOT(ACNO)+AMT
5130 PRINT@320,STRING$(64," "):P
RINT@320,"DESCRIPTION  ";:LINEIN
PUTPRP$:L=LEN(PRP$):IFL>14THEN51
30
5140 PST=1:YR$=STR$(YEAR):Y$=MID
$(YR$,4,2):YR=VAL(Y$):
5145 WRITE #1,ACNO,MO,DA,YR,CHK,
AMT,PRP$,PST:PUT #1,N
5147 IFDSW=1THEN5990ELSEIFCSW=2T
HEN5600ELSEIFSW=2THEN5770
5150 NEXTN:CLOSE #1:CLOSE #2:GOT
O5220
```

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ETT typing tutor (CocoWarehouse)	4-up	16K-Ext.	21.95
The Puzzler (ColorConnection)	4-up	32K-disk	29.95

PROGRAM TITLE	GRADES	MEMORY	PRICE
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McCoco's Menu	3-5	16K-Ext.	14.95
Moneypak	2-5	32K-Ext.	24.95
Graph Tutor	3-7	32K-Ext.	19.95
Graph-It	7-up	16K-Ext.	14.95
Math Invaders	1-8	16K-Ext.	17.95
Mathquiz - 4 operations	2-5	32K-Ext.	19.95
Addition & Subtraction	2-3	16K	11.95
Skill Tutor Series			
Division Tutor	3-7	16K-Ext.	14.95
Multiplication Tutor	3-7	16K-Ext.	14.95
Factors Tutor	5-8	16K-Ext.	19.95
Fractions Tutors (3 programs) addition, subtraction or multiplication	4-8	16K-Ext.	19.95ea.
Trigonometry	8-10	32K-Ext.	24.95
Equations Linear	7-9	32K-Ext.	19.95
Equations Quadratic	8-11	32K.Ext.	19.95
Arith. Diagnostic Disk	3-8	32K-disk	49.95
Fraction Diagnostic Disk	4-9	32K-disk	49.95
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Famous American Women	6-up	32K-Ext.	19.95
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Music Drill	3-up	16K-Ext.	19.95
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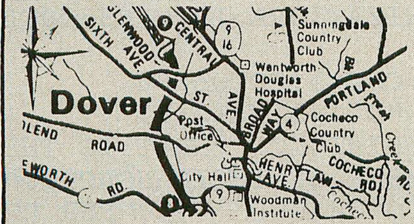

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```
5200 PRINT@416,STRING$(32,CHR$(1
28)):PRINT@448,"ENTER 'ZZZ' IN A
CCOUNT TO END   TRANSACTION ENTR
Y.";:PRINT@PP,"";:RETURN
5210 CLS:PRINT@128,"I AM COMPLET
ING THE WRITING OF  THE DETAIL T
RANSACTION FILE.";:FOR I=N TO 13
5:WRITE #1,999,99,99,99,0000,000
000.00,"XXXXXXXXXXXXXXXXX",1:PU
T #1,I:NEXTI:CLOSE #1:CLOSE #2
5220 CLS:PRINT@128,"I AM POSTING
 TRANSACTION TOTALS."
5300 OPEN "D", #1,"TRANSFLE/DAT"
,128
5302 I=0
5305 I=I+1
5310 GET #1,I:INPUT #1,YEAR
5311 FOR N=1 TO 12
5312 INPUT #1,TAMT(N)
5313 NEXT N
5315 IFCTOT(I)<>0 OR TTOT(I)<>0T
HENTAMT(MO)=TAMT(MO)-CTOT(I)+TTO
T(I)
5320 WRITE #1,YEAR:FOR N=1 TO 12
:WRITE #1,TAMT(N):NEXTN:PUT #1,I
5330 IF I=100 THEN 5340 ELSE 530
5
5340 CLOSE #1
5345 FORI=1TO100:TTOT(I)=0:CTOT(
I)=0:NEXTI:FORI=1TO12:TAMT(I)=0:
NEXTI
5350 GOTO5000
5400 CLS:IFCSW=2 OR SW=2 THENRET
URNELSEPRINT@128,"I AM LOADING A
CCOUNT           DESCRIPTIONS."
;:FORI=1TO100:GET #2,I:INPUT #2,
DA$(I):NEXTI:RETURN
5500 CLS:PRINT@128,"WHICH MONTH'
S TRANSACTIONS NEED CHANGING (99
 FOR MAIN MENU)";:INPUTA:IFA=99T
HEN160ELSEIFA<1ORA>12THEN5500ELS
E5510
5510 MO=A:CSW=1:GOTO5005
5520 OPEN "D",#1,FLE$,51
5522 CLS:PRINT@128,"WHAT IS THE
RECORD NUMBER OF THETRANSACTION
YOU WISH TO CHANGE  (999 FOR RET
URN TO MENU)";:INPUTRNO:IFRNO=99
9THEN5560ELSEIFRNO<1ORRNO>135THE
N5522ELSE5525
5525 GET #1,RNO:INPUT #1,ACNO,MO
,DA,YR,CHK,AMT,PRP$,PST:IFACNO=9
99THEN5610ELSEIFISW=1THEN5750ELS
EIFDSW=1THEN5950ELSECLS:PRINT"CH
ANGES FOR ";MO$(MO);",";YEAR:PRI
NT@32,STRING$(32,CHR$(128))
5526 PRINT@64,"RECORD NUM.  ";RN
O
```

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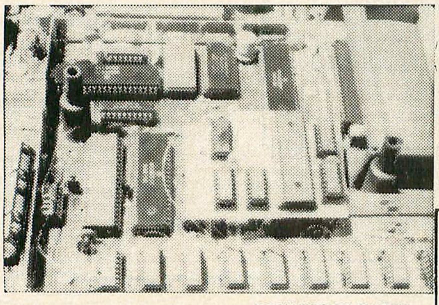

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```
5527 PRINT@128,"ACCOUNT....   ";A
CNO
5529 PRINT@160,"DATE(DA)...   ";D
A
5531 PRINT@192,"TRANS. I.D.   ";C
HK
5533 PRINT@224,"AMOUNT.....   ";:
PRINT@237,USING"##,###.##-";AMT
5535 PRINT@256,"DESCRIPTION   ";P
RP$
5536 IFDSW=1THEN5960ELSE5537
5537 PRINT@384,STRING$(32,CHR$(1
28)):PRINT@416,"IS THIS THE TRAN
SACTION YOU WISHTO CHANGE";:INPU
TA$:IF A$="Y" THEN 5580 ELSE IF
A$="N" THEN 5570 ELSE 5537
5550 CLS:PRINT@128,"TRANSACTIONS
 FOR THE MONTH YOU  ENTERED ARE
NOT ON FILE. PLEASE ENTER A DIFF
ERENT MONTH.":FORI=1TO 3000:NEXT
I:IFISW=1THEN5700ELSEGOTO5500
5560 CLOSE #1:GOTO5000
5570 CLOSE #1:GOTO5520
5580 CTOT(ACNO)=CTOT(ACNO)+AMT:O
PEN "D", #2,"CHRTACCT/DAT",30:GO
SUB5400
5590 N=RNO:CSW=2:CLS:PRINT"CHANG
ES FOR ";MO$(MO);",";YEAR:PRINT@
32,STRING$(32,CHR$(128)):GOTO504
5
5600 CLOSE #1:CLOSE #2:CLS:PRINT
@128,"DO YOU WISH TO MAKE MORE
     CHANGES FOR THIS MONTH";:I
NPUTA$:IFA$="Y"THEN 5520 ELSE IF
A$="N" THEN 5220 ELSE 5600
5610 IFISW=1THEN5760ELSEPRINT@32
0,"THE ABOVE RECORD NUMBER IS NO
T  ON FILE. PLEASE ENTER ANOTHER
  NUMBER.";:FORI=1TO3000:NEXTI:
IFDSW=1THEN5930ELSE5522
5700 SW=0:CLS:PRINT@128,"WHICH M
ONTH'S TRANSACTIONS NEED AN ADDI
TION (99 FOR MAIN MENU)";:INPUTM
O:IFMO=99THEN160ELSEIFMO<1ORMO>1
2THEN5700ELSE5710
5710 A=MO:ISW=1:GOTO5005
5720 A=MO:ISW=1:OPEN "D",#1,FLE$
,51
5730 CLS:PRINT@128,"WHAT IS THE
RECORD NUMBER YOU   WISH TO ADD
(999 FOR RETURN TO  MENU)";:INPU
TRNO:IFRNO=999THEN5560ELSEIFRNO<
1OR RNO>135THEN5730ELSE5740
5740 GOTO5525
5750 PRINT@320,"RECORD NUMBER AL
READY ON FILE.  PLEASE ENTER ANO
THER NUMBER.";:FORI=1TO3000:NEXT
I:GOTO5730
5760 MO=A:N=RNO:OPEN "D",#2,"CHR
TACCT/DAT",30:GOSUB5400:CLS:PRIN
```

One-Liner Contest Winner . . .

These two programs convert between EIA resistor color codes and resistance values. The first converts band colors to the value; the second takes a value and gives the three color bands.

The listings:

```
1 PRINT:DIMA(12),B(3):A(1)=2:A(2
)=3:A(3)=4:A(4)=7:A(5)=9:A(6)=1:
A(8)=5:A(10)=6:A(12)=8:S$="ROYVW
BNGNBEGY":FORI=1TO3:PRINT"ENTER
COLOR BAND";I;:INPUTA$:B(I)=A(IN
STR(S$,A$)):NEXT:PRINT"RESISTANC
E IS";INT(B(1)*10^(B(3)+1)+B(2)*
10^B(3));" OHMS":RUN
```

```
1 DIMA$(9):A$(0)="BK":A$(1)="BN"
:A$(2)="R":A$(3)="O":A$(4)="Y":A
$(5)="GN":A$(6)="BE":A$(7)="V":A
$(8)="GY":A$(9)="W":PRINT"RESIST
ANCE ";:INPUTD:C=INT(LOG(D)/LOG(
10)):IFC=0THENP=1ELSEP=C:IFC>0TH
ENC=C-1
2 D=D/10^P+.01:A=INT(D):B=(D-A)*
10:PRINT"COLOR CODE - ";A$(A);"
";A$(B);" ";A$(C):PRINT:RUN
```

Kurt Stefans
Roselle, IL

(For these winning one-liner contest entries, the author has been sent copies of both *The Second Rainbow Book Of Adventures* and its companion *The Second Rainbow Adventures Tape*.)

One-Liner Contest Winner . . .

The first program lets you type in the price of a car, the interest rate and number of payments to get the amount of each payment; the second takes the payment amount, interest rate and number of payments and gives you the pay-off balance.

The listings:

```
1 CLS:PRINT@10,"CAR PAYMENT":INP
UT"BAL";A:INPUT"ANNUAL INTEREST
RATE";B:INPUT"NUMBER OF PAYMENTS
";C:D=A/((1-((1+((B/12)/100))^(-
C)))/((B/12)/100)):PRINT"PAYMENT
S WILL BE $";:PRINTUSING"#####.#
#";D:INPUT"ANOTHER (Y/N)";A$:IFL
EFT$(A$,1)="Y"THEN1ELSEEND
```

```
2 CLS:INPUT"AMOUNT OF PAYMENT";A
:INPUT"ANNUAL INTEREST RATE";B:I
NPUT"NUMBER OF PAYMENTS LEFT";C:
E=A*((1-((1+((B/12)/100))^(-C)))
/((B/12)/100)):PRINT"PAYOFF BALA
NCE $";:PRINTUSING"######.##";E
:INPUT"ANOTHER (Y/N)";A$:IF LEFT
$(A$,1)="Y"THEN2ELSEEND
```

Charles Stauber
Great Lakes, IL

(For these winning one-liner contest entries, the author has been sent copies of both *The Second Rainbow Book Of Adventures* and its companion *The Second Rainbow Adventures Tape*.)

```
T"ADDITIONS FOR ";MO$(MO);",";YE
AR:PRINT@32,STRING$(32,CHR$(128)
):SW=2:GOTO5045
5770 CLOSE #1:CLOSE #2:CLS:PRINT
@128,"DO YOU WISH TO ADD MORE
     TRANSACTIONS TO THIS MONTH
";:INPUTA$:IFA$="Y"THEN5720ELSEI
FA$="N"THEN5220ELSE5770
5900 CLS:PRINT@128,"WHICH MONTH'
S TRANSACTIONS NEED AN ITEM DELE
TED (99 FOR RETURN  TO MENU)";:I
NPUTA:IFA=99THEN160ELSEIFA<0 OR
A>12THEN5900ELSE5910
5910 DSW=1:MO=A:GOTO5005
5920 DSW=1:MO=A:OPEN "D",#1,FLE$
,51
5930 CLS:PRINT@128,"WHAT IS THE
RECORD NUMBER YOU  WISH TO DELE
TE (999 FOR RETURN  TO MENU)";:I
NPUTRNO:IFRNO=999THEN5560ELSEIFR
NO<1 OR RNO>135THEN5930ELSE5940
5940 GOTO5525
5950 CLS:PRINT"DELETIONS FOR ";M
O$(MO);",";YEAR:PRINT@32,STRING$
(32,CHR$(128)):GOTO5526
5960 PRINT@384,STRING$(32,CHR$(1
28)):PRINT@416,"IS THIS THE TRAN
SACTION YOU WISHTO DELETE";:INPU
TA$:IF A$="Y"THEN5980 ELSE IF A$
="N" THEN5930 ELSE5536
5980 CTOT(ACNO)=CTOT(ACNO)+AMT:N
=RNO:ACNO=999:AMT=0:GOTO5145
5990 CLS:PRINT@128,"DO YOU WISH
TO DELETE MORE      TRANSACTIONS
 FOR THIS MONTH";:INPUTA$:IFA$="
Y"THEN5930ELSEIFA$="N"THEN5995EL
SE5990
5995 CLOSE#1:GOTO5220
6000 BSW=1:GOTO360
6010 BSW=0:GOTO3270
7000 DLSW=1:CLS:PRINT@128,"WHICH
 MONTH'S BUDGET DO YOU WISHTO DI
SPLAY";:INPUTA:IFA<1ORA>12THEN70
00
7010 GOSUB11950:GOSUB11980
7015 SUMBUD=0:FORI=1TO100 STEP4
7017 PRINT@480,"======SEARCHING
FOR DATA.======"
7020 CLS:IF SW8=1 THEN 7080 ELSE
 PRINT@0,"BUDGET FOR ";MO$(MO);Y
EAR:PRINT STRING$(32,"-")
7035 PRSW=0:FOR X=I TO I+3:IF MI
D$(DA$(X),1,5)="XXXXX" OR CTOT(X
)=0 THEN 7036 ELSE PRINT DA$(X):
PRINT USING"%  %###%%$###,###.##
-";"ACT ";X;"  ";CTOT(X):PRINT:P
```

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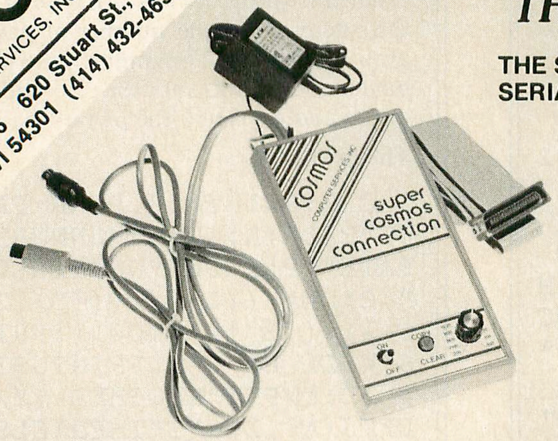

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```
RSW=1:SUMBUD=SUMBUD+CTOT(X)
7036 NEXTX:IF PRSW <> 1 THEN 704
5 ELSE PRINT@480,"PRESS <ENTER>
TO CONTINUE.";:
7040 IK$=INKEY$:IF IK$ <> CHR$(1
3) THEN 7040
7045 NEXTI:CLS:IF SW8=1 THEN 705
0 ELSE PRINT"BUDGET FOR ";MO$(MO
);YEAR:GOTO7060
7050 PRINT "ACTUAL FOR ";MO$(MO)
;YEAR
7060 PRINT STRING$(32,"-"):SW8=0
:PRINT USING "%            %$###,###
.##-";"TOTAL-->  ";SUMBUD:SUMBUD
=0:PRINT@480,"PRESS <ENTER> TO C
ONTINUE.";:
7065 IK$=INKEY$:IF IK$ <> CHR$(1
3) THEN 7065 ELSE 160
7080 PRINT@0,"ACTUAL FOR ";MO$(M
O);YEAR:PRINT STRING$(32,"-"):GO
TO7035
8000 DLSW=1:SW8=1:CLS:PRINT@128,
"WHICH MONTH'S ACTUAL DATA DO YO
UWISH TO DISPLAY";:INPUTA:IFA<1O
RA>12THEN8000
8010 GOSUB11960:GOSUB11950:GOSUB
11985:FORI=1TO100:CTOT(I)=TT0T(I
):NEXTI:GOTO7015
8990 CLS:PRINT"********* SELECTI
ONS *********":PRINT:PRINT"1) DI
SPLAY A MONTH":PRINT:PRINT"2) DI
SPLAY YEAR-TO-DATE":PRINT:PRINT"
3) RETURN TO MAIN MENU":PRINT:PR
INT" ";:INPUTA:ON A GOTO 8995,90
00,160,8990
8995 CLS:PRINT@128,"WHICH MONTH'
S ACTUAL VS. BUDGET DO YOU WISH
TO DISPLAY";:INPUTA:IFA<0ORA>12T
HEN8995ELSE9010
9000 YRSW=1:DLSW=1:CLS:PRINT@128
,"ENTER MONTH FOR WHICH YOU WISH
  TO DISPLAY YEAR TO DATE THROUG
H ";:INPUTA:IFA<1ORA>12THEN9000
9010 GOSUB11960:GOSUB11950:GOSUB
11985:GOSUB11980
9020 A=0:B=0:FORI=1TO100 STEP 4
9023 PRINT@480,"======SEARCHING
FOR DATA.======";:
9024 IF YRSW=1 THEN 9025 ELSE 90
27
9025 IF YRSW <> 1 THEN 9027 ELSE
 CLS:PRINT@0,"ACTUAL VS. BUDGET"
:PRINT"THRU ";MO$(MO);YEAR:PRINT
 STRING$(31,"-"):GOTO9030
9027 CLS:PRINT@0,"ACTUAL VS. BUD
GET":PRINT MO$(MO);YEAR:PRINT ST
```

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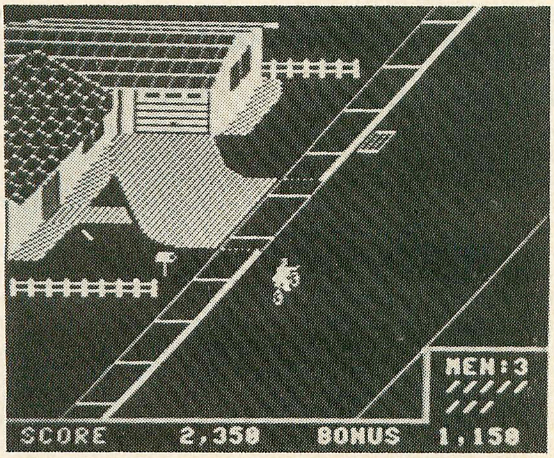
```
RING$(31,"-")
9030 PRSW=0:FOR X=I TO I+3:IF MI
D$(DA$(X),1,5)="XXXXX" OR CTOT(X
)=0 AND TTOT(X)=0 THEN 9033 ELSE
 PRINT DA$(X):PRINT USING"% %###
,###.##-%    %###,###.##-";"A) ";
TTOT(X);"  B) ";CTOT(X)
9031 A=A+TTOT(X):B=B+CTOT(X):PRS
W=1:CTR1=CTR1+A:CTR2=CTR2+B
9033 NEXTX:IF PRSW <> 1 THEN 904
5 ELSE PRINT@480,"PRESS <ENTER>
TO CONTINUE.";:
9040 IK$=INKEY$:IF IK$ <> CHR$(1
3) THEN 9040
9045 NEXTI:IF YRSW <> 1 THEN 904
7 ELSE CLS:PRINT"ACTUAL VS. BUDG
ET":PRINT"THRU ";MO$(MO);YEAR:PR
INT STRING$(31,"-"):PRINT:GOTO90
50
9047 CLS:PRINT"ACTUAL VS. BUDGET
":PRINT MO$(MO);YEAR:PRINT STRIN
G$(31,"-"):PRINT
9050 YRSW=0:PRINT"             TO
TALS":PRINT:PRINT USING"% %###,#
##.##-%    %###,###.##-";"A) ";A;
"  B) ";B:A=0:B=0:PRINT@480,"PRE
SS <ENTER> TO CONTINUE";:
9055 IK$=INKEY$:IF IK$ <> CHR$(1
3) THEN 9055 ELSE 160
10000 CLS:PRINT"***********SELEC
TIONS***********":PRINT"1) DISPL
AY ALL ACCOUNT             DESCR
IPTIONS":PRINT:PRINT"2) DISPLAY
SINGLE ACCOUNT             DESCRIPT
ION":
10002 PRINT:PRINT"3) RETURN TO M
AIN MENU":PRINT:PRINT" ";:INPUTA
:ON A GOSUB 10010,10500,160:GOTO
10000
10010 RC=1:GOTO4010
10500 CLS:OPEN "D",#1,"CHRTACCT/
DAT",30
10510 CLS:PRINT@128,"ENTER ACCOU
NT NUMBER YOU WISH   TO DISPLAY"
;:INPUTAC:IF AC<0 OR AC>100 THEN
 10510
10520 RC=1:GOTO4520
10530 RC=0:CLOSE #1
10540 PRINT@416,"ENTER <R> TO RE
TURN TO MAIN     MENU.";:INPUTA$
10550 IF A$="R" GOTO 160
10560 GOTO 10540
11000 CLS:PRINT@128,"I AM LOADIN
G THE PROGRAM FOR THEREPORT GENE
RATOR.":RUN"REPTGENR"
11700 CLS:PRINT@96,"THE 1ST PRIN
T LINE SHOULD BE    ABOUT 3/4 IN
CHES FROM THE TOP   OF PAPER. PL
EASE ALIGN. WHEN    PAPER IS ALI
GNED PROPERLY TYPE  <YES> IN RES
PONSE TO QUESTION.":PRINT:PRINT"
IS PRINTER READY";:INPUTA$:IFA$=
"YES"THENRETURNELSE11700
11800 I=1:LC=0:CLS:PRINT@98,"PRI
NTING CHART OF ACCOUNTS.":OPEN "
D",#1,"CHRTACCT/DAT",30
11810 PRINT#-2,"            ACT <
--D E S C R I P T I O N-->":PRIN
T#-2:
11820 GET#1,I:INPUT #1,DESC$:D$=
MID$(DESC$,1,5):IFD$="XXXXX"THEN
11825ELSEPRINT#-2, USING"%
  %###%%%
      %";"            ";I;"  ";DES
C$:LC=LC+1:I=I+1:IFLC=50THENGOSU
B11880ELSEIFI=101THEN11890ELSE11
820
11825 I=I+1:IFI=101THEN11890ELSE
11820
11830 GOTO11810
11880 FORX=1TO14:PRINT#-2:NEXTX:
LC=0:RETURN
11890 FOR X=LC TO 63:PRINT#-2:NE
XTX:LC=0:CLOSE#1:GOTO160
11900 GET #1,I:INPUT #1,ACNO,MO,
DA,YR,CHK,AMT,PRP$,PST:RETURN
11910 PRINT#-2:LC=LC+1:IFLC=59TH
EN160ELSE11910
11950 CLS:PRINT@96,"ONE MOMENT P
LEASE, I AM LOADING ACCOUNT DESC
RIPTIONS.":OPEN "D",#1,"CHRTACCT
/DAT",30:FORI=1TO100:GET #1,I:IN
PUT #1,DESC$:DA$(I)=DESC$:NEXTI:
CLOSE #1:RETURN
11960 CLS:PRINT@128,"I AM CHECKI
NG TO SEE IF THE DATAFOR THE MON
TH YOU SELECTED IS ONFILE.":MO=A
:OPEN "D",#1,"FILENAME/DAT",21:F
ORI=1TO12:GET #1,I:INPUT #1,YEAR
,FLE$:FL$(I)=FLE$:NEXTI:CLOSE#1
11965 IF FL$(MO) = "ZZZZZZZZ/ZZZ
" THEN 11970 ELSE RETURN
11970 PRINT:PRINT"DATA FOR THE M
ONTH YOU ENTERED  IS NOT ON FILE
. I AM RETURNING  TO MENU.":FORT
=1TO3000:NEXT T:IF DLSW=1 THEN 1
2030 ELSE 11000
11980 MO=A:CLS:PRINT@98,"I AM LO
ADING BUDGET DATA.":OPEN "D",#1,
"BUDGET/DAT",128:FORI=1TO100:GET
 #1,I:INPUT #1,YEAR:FORX=1TO12:I
NPUT #1,BAMT(X):NEXTX:IF YRSW=1
THEN11982ELSECTOT(I)=BAMT(MO)
11981 NEXTI:CLOSE#1:RETURN
11982 FOR II=1 TO MO:CTOT(I)=CTO
T(I)+BAMT(II):NEXT II:GOTO11981
11985 CLS:PRINT@96,"I AM LOADING
 ACTUAL DATA.":OPEN "D",#1,"TRAN
```

DIECOM PRODUCTS

PAPER ROUTE



As a paper boy, you ride your bike along your route delivering papers to your customers. Break customers' windows or damage their property and they will cancel their subscriptions! Earn bonus points by damaging non-subscribers' property. Avoid pedestrians, cars, and maybe even a mad dog in your attempt to deliver all your papers! Detailed graphics and lots of surprises make this game a real challenge for everyone.

64 k and joystick required
tape or disk
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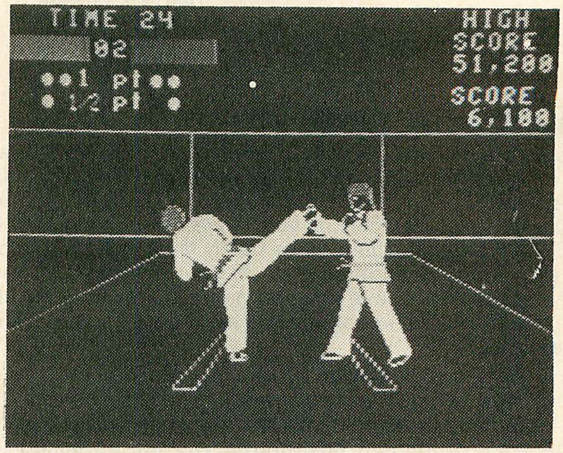
KARATE



Challenge the computer, or a friend to a Karate match! In this game, you will use various Karate punches and kicks to knock your opponent down and earn points to win the match. When challenging the computer, your opponent's Karate skills increase as you win matches. This game is a challenge for even the expert game player.

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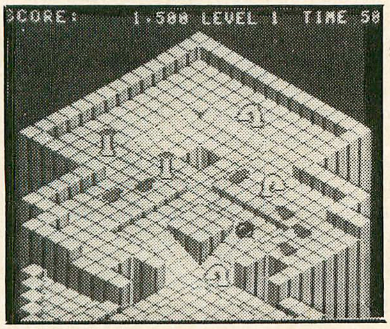
MARBLE MAZE



Move your marble around the mazes in your search for the finish line! Avoid the marble eaters, acid puddles and other creatures that inhabit the mazes. Avoid falling into holes or off the edges of the maze. Eight different levels and great graphics make this game a must for your collection. Congratulations to the contest winners!

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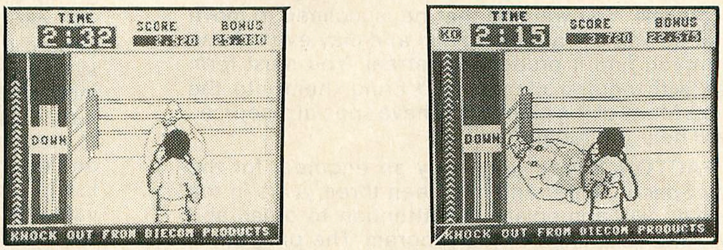
KNOCK OUT


TIME
2:32
SCORE
BONUS
DOWN
KNOCK OUT FROM DIECOM PRODUCTS
KO
TIME
2:15
SCORE
BONUS
DOWN
KNOCK OUT FROM DIECOM PRODUCTS

Fight against five different boxers in this great boxing game! At first the boxers are easy to knock out, but beware, it gets harder as you move on. The boxers are out to stop you in your quest to become champion of the world. But once you become champion your task is not over. You will then have to defend your title against those trying to regain the championship from you. Outstanding graphics make this a must for your collection!

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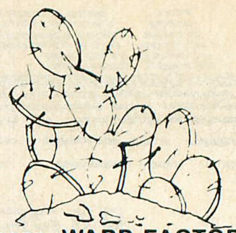

HALL OF THE KING

This program combines all the things you look for in a great two disk graphics adventure program. The Hi-Res graphics are superbly done. The text portion of the screen and the graphics change quickly as you move through the **HALL OF THE KING.** You can move freely from one portion of the adventure to another. Call up your inventory at any time. You can even save or load a game at ANY time. **HALL OF THE KING** will challenge even the most seasoned adventurer.

In an age long past, a dwarven race lived in their mountain home. They were forced to flee under threat of destruction leaving behind their most powerful possession, the Earthstone. As a prominent adventurer, you will be asked to undertake a perilous quest, the recovery of the Earthstone! This is your FIRST adventure in the search for what is deemed to have been the cornerstone of the legendary power of the dwarves.

HALL OF THE KING requires 64K EB and one disk drive. This exciting two disk adventure comes packaged in a vinyl library case. **$39.95**

WARP FACTOR X

If you have been waiting for a game for your color computer that has everything, your wait is over. **WARP FACTOR X** is here. This all graphics simulation game requires strategy, fast thinking, an eye for detail, and above all experience in knowing the capabilities of your starship and its computer. You will begin your adventure into space as a cadet but your ultimate goal is to become Captain of the Enterprise. To do this you must neutralize the enemy planets and eliminate the Klingon starbases along with the Klingons themselves.The Klingon is not a "Robot." He has the same capabilities as your starship but he is also subject to the same problems. You will find that he is inclined to move around while you are attacking him and may even chase you when you find it prudent to retreat. You must form alliances with neutral planets and bring them into the federation. Many of the planets will have special resources which will help the federation.

WARP FACTOR X was written by an engineer for the Kennedy Space Center and has been three years in the making. You will appreciate the attention to detail and complex inner workings of the program. The program is supported by eight pages of documentation important to the success of your mission. Your progress through the eighteen sectors of the galaxy will be recorded and saved for your next adventure into space. **WARP FACTOR X** includes versions for 32K, 64K, and COCO 2. It requires one disk drive and comes packaged in a vinyl library case. **$34.95**

DARKMOOR HOLD

NEW

You and your comrades will explore the levels of Darkmoor Hold in an effort to gain great riches and defeat the dark wizard. The Wizard will soon realize the threat you pose and the many monsters you meet and battle will become stronger and more powerful as you move through the 10 levels of Darkmoor. A keen eye will help you find weapons and armor to aid your battle along with treasures for you to keep. Your party consists of a Dwarf, an Elf, and you, the Human, each with their own special attributes. The weapons, armor and treasure are placed randomly in each level to provide a new challenge each time you play. You may also save the game you are playing since defeating the evil Wizard is not an easy task. It has great graphics and an impressive text screen to give you more fun than a barrel of elves. Requires 64KEB and 1 disk drive. **$29.95**

FAMILY-TREE

FAMILY-TREE is a sophiticated program that can help organize your families' history. Whether you are new to genealogy or an experienced genealogist you will find **FAMILY-TREE** of great assistance. It is specifically designed to organize family relationships and supply information on each person. Information can be listed on the screen or printer even a pedigree chart listing up to 4 generations. Records can be altered or deleted and additions made quickly and easily. Each file can contain over 160 names and, of course, you can have files for every branch of the family. Smaller files can be combined. There is even a help file on the disk version. Requires 64K. **TAPE — $24.95; DISK — $29.95**

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```
SFLE/DAT",128:FORI=1TO100:GET#1,
I:INPUT#1,YEAR:FORX=1TO12:INPUT#
1,TAMT(X):YTOT(I)=YTOT(I)+TAMT(X
):NEXTX:IF YRSW=1 THEN11987ELSE
TTOT(I)=TAMT(MO)
 11986 NEXTI:CLOSE#1:RETURN
 11987 FOR II=1 TO MO: TTOT(I)=TT
OT(I)+TAMT(II):NEXT II:GOTO11986
 12000 DLSW=1:CLS:PRINT"*********
 SELECTIONS **********":PRINT:PR
INT"1) DELETE A MONTH'S TRANSACT
IONS":PRINT"2) DELETE A MONTH'S
BUDGET":PRINT:PRINT"3) RETURN TO
 MAIN MENU":PRINT:PRINT" ";:INPU
TA:IFA<1ORA>3THEN12000
 12001 ON A GOTO 12005,12200,160
 12005 CLS:PRINT@128,"WHICH MONTH
'S TRANSACTIONS DO   YOU WISH TO
 DELETE ";:INPUTA:IFA<1ORA>12THE
N12005ELSEGOSUB12007
 12006 GOSUB11960:GOTO12010
 12007 PRINT:PRINT"ARE YOU SURE (
ENTER <N> FOR      RETURN TO MAIN
 MENU OTHERWISE     ENTER <Y> TO D
ELETE) ?";:
 12008 IK$=INKEY$:IF IK$="N" THEN
 160 ELSE IF IK$="Y" THEN RETURN
 ELSE 12008
 12010 DLSW=0:CLS:PRINT@128,"I AM
 DELETING DATA IN FILE":PRINT FL
$(MO):KILL FL$(MO):FL$(MO)="ZZZZ
ZZZZ/ZZZ":OPEN "D",#1,"FILENAME/
DAT",21:FORI=1TO12:WRITE #1,YEAR
,FL$(I):PUT#1,I:NEXTI:CLOSE#1
 12012 FLNM$="TRANSFLE/DAT"
 12015 OPEN "D",#1,FLNM$,128:FORI
=1TO100:GET#1,I:INPUT #1,YEAR:FO
R N=1 TO 12:INPUT #1,TAMT(N):NEX
TN
 12020 TAMT(MO)=0:WRITE #1,YEAR:F
OR N=1 TO 12:WRITE#1,TAMT(N):NEX
TN:PUT #1,I:NEXTI:CLOSE #1:GOTO1
60
 12030 DLSW=0:GOTO160
 12200 CLS:PRINT@128,"WHICH MONTH
'S BUDGET DO YOU WISHTO DELETE "
;:INPUTA:IFA<1ORA>12THEN12200ELS
EGOSUB12007
 12210 CLS:PRINT@128,"I AM DELETI
NG BUDGET DATA.":FLNM$="BUDGET/D
AT":MO=A:GOTO12015
 13000 CLS:PRINT@128,"ARE YOU REA
DY TO BACKUP YOUR    FILES (Y/N)
";:INPUTA$:IFA$="N"THEN160ELSEIF
A$="Y"THEN13005ELSE13000
 13005 CLS:PRINT@128,"REMOVE DISK
ETTE AND WRITE        PROTECT. I
NSERT WRITE PROTECTEDDISKETTE AN
D PRESS <R>."
 13006 IK$=INKEY$:IF IK$="R"THEN1
3010ELSE13006
 13010 CLS:PRINT@128,"BACKING UP
FILES.":BACKUP0:END
 18000 CLS0:PRINT@192,"SO LONG TI
LL NEXT TIME. MAY ALL YOUR EXPEN
SES BE SMALL.";
 18010 END
```

		11400	81
40	190	11500	181
11115	105	11600	172
11145	52	11800	177
11239	102	11960	193
11350	207	END	135

Listing 3: REPTGENR

```
0 PCLEAR1
5 CLS0
6 PRINT" EXPENSE TRACKING & MANA
GEMENT"
12 PRINT@64,STRING$(32,"$");:PRI
NT"           author
  ";:PRINT"              EDDIE HIL
L":PRINT"       124 STERLING DRI
VE":PRINT"        HUEYTOWN, AL 35
023":PRINT"           (205)491-145
2":PRINT STRING$(32,"$");:
15 PRINT"            requirements
       ";:PRINT"       64K COCO D
ISK BASIC 1.1":PRINT"
DISK DRIVE":PRINT"         DMP 10
0 PRINTER":PRINT STRING$(32,"$")
;:
19 PRINT@481,"PART II===========
=AUGUST 1985";:
20 P=64:FORI=1TO12:PRINT@P,"$";:
PRINT@P+31,"$";:P=P+32:NEXTI:FOR
X=1TO9999:NEXTX
21 DATA "JANUARY","FEBRUARY","MA
RCH","APRIL","MAY","JUNE","JULY"
,"AUGUST","SEPTEMBER","OCTOBER",
"NOVEMBER","DECEMBER"
29 CLEAR3000
30 FILES 3:DIM BAMT(12),TAMT(12)
,VAR(12),MO$(12),FL$(12),TTOT(10
0),DA$(100),CTOT(100),YTOT(100)
40 FORI=1TO12:READMO$(I):NEXTI:R
ESTORE
50 GOTO11000
160 CLS:PRINT@133,"ONE MOMENT PL
EASE.":DLSW=0:FOR I=1TO100:DA$(I
)="":CTOT(I)=0:TTOT(I)=0:YTOT(I)
=0:NEXTI
11000 TRSW=0:TT=0:CLS:PRINT"****
******SELECTIONS**********":PRI
NT:PRINT"1) LIST MONTHLY TRANSAC
```

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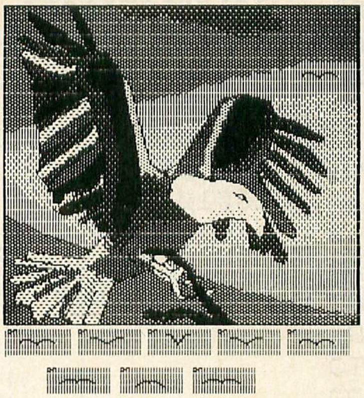

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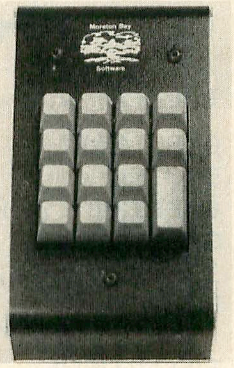

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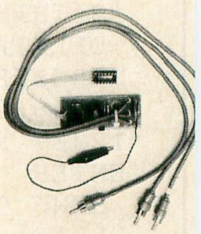

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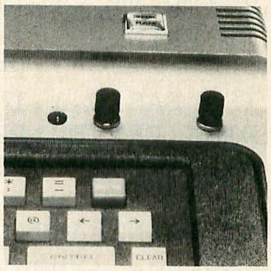

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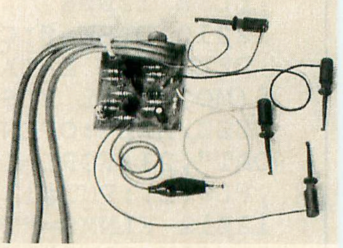
Finally a monitor driver for the Color Computer II that lets you use a monochrome and a color monitor simultaneously. We're proud of this new driver. The six transister circuit provides optimal signal mixing and signal gain. Excellent monochrome output and better quality resolution in the color ouput than any driver we have seen. Audio output also. Fits all models of the Color Computer II. $29.95.



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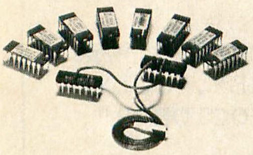

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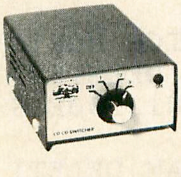

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```
TIONS":PRINT"2) LIST MONTHLY BUD
GET":PRINT"3) LIST BUDGET FOR YE
AR":PRINT"4) LIST ACTUAL FOR YEA
R":
11001 PRINT"5) LIST TRANS. SUM.
FOR YEAR":PRINT"6) LIST MO. ACTU
AL VS. BUDGET":
11005 PRINT"7) LIST YTD ACTUAL V
S. BUDGET":PRINT"8) LIST CHART O
F ACCOUNTS":PRINT"9) RETURN TO M
AIN PROGRAM":PRINT"10) END SESSI
ON":PRINT:PRINT" ";:INPUTA:ON A
GOSUB 11110,11200,11300,13000,11
400,11500,11600,11699,12000,1800
0:GOTO11000
11110 CLS:PRINT@128,"WHICH MONTH
 DO YOU WISH TO LIST";:INPUTMO:I
F MO <0 OR MO >12 THEN11110 ELSE
 AP$=LEFT$(MO$(MO),3):A=MO
11115 GOSUB11960
11125 GOSUB11950
11126 GOSUB11700:CLS:PRINT@128,"
I AM PRINTING THE DETAIL
TRANSACTIONS FOR ";MO$(MO);".";:
FLE$="DTLTRANS/"+AP$:OPEN "D",#1
,FLE$,51
11128 PRINT #-2,TAB(19) "MONTHLY
 TRANSACTIONS FOR ";MO$(MO);YEAR
;:PRINT#-2:PRINT#-2:PRINT #-2,TA
B(0) "REC  ACT";:PRINT #-2,TAB(4
0) "TRAN":PRINT #-2,TAB(0) "NUM
 NUM  .....ACCOUNT DESCRIPTION..
... I.D.  DA  ..AMOUNT..  TRANS.
 DESCRIPTION";:PRINT#-2:
11129 LC=0:IFPSW<>1THEN11130ELSE
11150
11130 FOR I=1 TO 135:GOSUB11900:
IFACNO=999THEN11140
11131 PRINT#-2:PRINT#-2, USING"#
##%%###%%%
    %%%####%%##%%##,###.##-%%%
              %";I;SPACE$;ACNO;S
PACE$;DA$(ACNO);SPACE$;CHK;"";DA
;"";AMT;"";PRP$;:
11135 TT=TT+AMT:LC=LC+1:IFLC=50T
HENGOSUB11145
11140 NEXTI:PRINT#-2:PRINT#-2:PR
INT#-2,TAB(30)"TOTAL----------->
 ";:PRINT#-2, USING"$###,###.##-
";TT;:PRINT#-2:TT=0:CLOSE #1:CLO
SE #2:PSW=0:GOTO11910
11145 PSW=1:FORX=1TO12:PRINT#-2:
NEXTX:GOTO11128
11150 I=I+1:GOSUB11900:IFACNO=99
9THEN11140ELSE11131
11200 CLS:PRINT@96,"WHICH MONTH'
S BUDGET DO YOU WANTTO LIST";:IN
PUTA:IFA<0ORA>12THEN11200ELSE112
05
11205 MO=A:GOSUB11950:GOSUB11980
:GOSUB11700
11210 I=1:LC=0:CLS:PRINT@96,"I A
M PRINTING BUDGET DATA FOR   ";M
O$(MO);YEAR;"."
11215 PRINT#-2,"          ";"BUD
GET FOR ";MO$(MO);YEAR:PRINT#-2:
11220 PRINT#-2,"          ";"ACT
 <--D E S C R I P T I O N-->   .
.AMOUNT..":PRINT#-2:
11230 IF DA$(I)=STRING$(27,"X")
OR CTOT(I)=0 THEN11240ELSEBUDSUM
=BUDSUM+CTOT(I):PRINT#-2,USING"%
        %###%%
        %%%###,###.##-";"
   ";I;"  ";DA$(I);"  ";CTOT(I):
LC=LC+1:I=I+1:IFLC=50THENGOSUB11
880ELSEIFI=101THEN11235ELSE1123
11235 PRINT#-2:PRINT#-2,USING"%
  %%   %%%###,###.##-";SPACE$;"T
OTAL";"  ";BUDSUM
11239 GOTO11890
11240 I=I+1:IFI=101THEN11235ELSE
11230
11300 RN$="BUDGET":GOSUB11950:FO
RX=1TO12:TAMT(X)=0:NEXTX:GOSUB11
700:OPEN "D",#1,"BUDGET/DAT",128
:I=1:LC=0:ACNO=I
11310 IF TRSW=1 THEN 11311 ELSE
CLS:PRINT@96,"I AM PRINTING THE
BUDGET FOR THEYEAR.":GOSUB11320:
GOTO11335
11311 CLS:PRINT@96,"I AM PRINTIN
G THE ACTUAL FOR THEYEAR.":GOSUB
11320:GOTO11335
11320 GET #1,I:IFDA$(I)=STRING$(
27,"X")THEN11370ELSEINPUT#1,YEAR
:FORX=1TO12:INPUT#1,BAMT(X):NEXT
X:RETURN
11335 PRINT#-2,STRING$(80,"-"):
11340 PRINT#-2,TAB(36) "JAN
    FEB         MAR         APR"
:PRINT#-2,TAB(36) "MAY         J
UN         JUL         AUG":PRIN
T#-2,RN$;" FOR ";YEAR;STRING$(19
," ");"SEP         OCT         N
OV         DEC":PRINT#-2,STRING$
(80,"-");:PRINT#-2
11350 PRINT#-2,USING"%
                %%%##,###.##-%%#
#,###.##-%%##,###.##-%%##,###.##
-";DA$(I);"  ";BAMT(1);"  ";BAMT
(2);"  ";BAMT(3);"  ";BAMT(4):
11353 SUMBUD=0:FORX=1TO12:SUMBUD
=SUMBUD+BAMT(X):TAMT(X)=TAMT(X)+
BAMT(X):NEXTX
11355 PRINT#-2,USING"%
                 %###,###.##-%%#
#,###.##-%%##,###.##-%%##,###.##
```

```
-";SPACE$;BAMT(5);"  ";BAMT(6);"
  ";BAMT(7);"  ";BAMT(8):
11360 PRINT#-2,USING"###%
%$###,###.##-%     %##,###.##-%%#
#,###.##-%%##,###.##-%%##,###.##
-";ACNO;"  TOTAL...";SUMBUD;SPAC
E$;BAMT(9);"  ";BAMT(10);"  ";BA
MT(11);"  ";BAMT(12)
11365 IFTSW=1THEN11390ELSEPRINT#
-2:LC=LC+4:I=I+1:ACNO=I:IFI=101T
HEN11380ELSEIFLC=52THEN11398ELSE
GOSUB11320:GOTO11350
11370 I=I+1:ACNO=I:IFI=101THEN11
380ELSE11320
11380 I=1:ACNO=999:DA$(I)="TOTAL
 "+RN$+" FOR YEAR        ":FORX=1T
O12:BAMT(X)=TAMT(X):NEXTX:TSW=1:
GOTO11350
11390 LC=LC+2:TSW=0:GOTO11890
11398 LC=0:FORX=1TO9:PRINT#-2:NE
XTX:GOSUB11320:GOTO11335
11400 YRSW=1:CLS:PRINT@128,"PLEA
SE ENTER TODAY'S DATE.      (SLA
SHES MUST BE ENTERED)":PRINT:PRI
NT"DATE (MM/DD/YY)... ";:INPUTDT
$:GOSUB11950:GOSUB11985:GOSUB117
00
11405 CLS:PRINT@96,"I AM PRINTIN
G A SUMMARY OF THE  TRANSACTIONS
 FOR THE YEAR."
11408 LC=0:I=1:SUMTOT=0
11410 PRINT#-2,"TRANSACTION SUMM
ARY FOR";YEAR;"....A/0 ";DT$:PRI
NT#-2:PRINT#-2,"ACT  ....ACCOUNT
 DESCRIPTION....  ...AMOUNT...":
PRINT#-2:
11420 IF YTOT(I)=0 THEN 11430 EL
SE PRINT#-2,USING"###%%
                   %%%###,###.##-"
;I;"  ";DA$(I);"  ";YTOT(I):SUMT
OT=SUMTOT+YTOT(I):LC=LC+1:IFLC=5
0THEN11440
11430 I=I+1:IFI=101THEN11450ELSE
11420
11440 I=I+1:IF I=101 THEN 11450
ELSE FORX=1TO12:PRINT#-2:NEXTX:L
C=0:GOTO11410
11450 YRSW=0:CLOSE#1:PRINT#-2:PR
INT#-2,USING"%
     %%     %$###,###.##-";SPAC
E$;"TOTAL  ";SUMTOT:LC=LC+2:SUMT
OT=0:FORX=LC TO 61:PRINT#-2:NEXT
X:LC=0:GOTO160
11500 CLS:PRINT@128,"WHICH MONTH
 DO YOU WISH TO     LIST";:INPU
TA:IFA<1 OR A>12 THEN11500
11515 GOSUB11960:GOSUB11950:GOSU
B11980:GOSUB11985:GOSUB11700:CLS
:PRINT@128,"I AM PRINTING ACTUAL
 VS. BUDGET FOR ";MO$(MO);YEAR
11520 LC=0:I=1:ACTOT=0:SUMBUD=0
11525 GOSUB11650:PRINT#-2:PRINT#
-2," ACT  ...D E S C R I P T I
O N...  ...ACTUAL..  ...BUDGET
```

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The listing:

```
0 CLS:PRINT@8,"QUICK BUDGET":PRI
NT:INPUT"       AMOUNT OF PAYCHECK
";A:CLS:INPUT"          NUMBER OF B
ILLS";B:CLS:FORX=1TOB:PRINT:INPU
T"       AMOUNT OF BILL";C:BB=A-
C:PRINT"          PAYCHECK  LEFT"BB
:FORZ=1TO3000:NEXT:A=BB:NEXTX:CL
S:PRINT"          PAYCHECK LEFT
```

David V. Haas
Eglin AFB, FL

(For this winning one-liner contest entry, the author has been sent copies of both *The Second Rainbow Book Of Adventures* and its companion *The Second Rainbow Adventures Tape*.)

```
..    ..VARIANCE.":PRINT#-2
11530 IF MID$(DA$(I),1,5)="XXXXX
" THEN 11550 ELSE PRINT#-2,USING
"%%####%%%
  %% %###,###.##-% %###,###.##-%
 %###,###.##-";"  ";I;"  ";DA$(I
);"  ";TTOT(I);"   ";CTOT(I);"
  ";CTOT(I)-TTOT(I):ACTOT=ACTOT+
TTOT(I):
11535 SUMBUD=SUMBUD+CTOT(I):LC=L
C+1:
11550 I=I+1:IFI=101THEN11560ELSE
IFLC=50THEN11555ELSE11530
11555 FOR X=LC TO 61:PRINT#-2:NE
XTX:LC=0:GOTO11525
11560 PRINT#-2:PRINT#-2,USING"%
                   %%          %%
 %$###,###.##-%%$###,###.##-%%$#
##,###.##-";SPACE$;"TOTAL ---->"
;"  ";ACTOT;"  ";SUMBUD;"  ";SUM
BUD-ACTOT:FOR X=LC TO 59:PRINT#-
2:NEXTX:YRSW=0:GOTO160
11600 YRSW=1:CLS:PRINT@128,"ENTE
R MONTH FOR WHICH YOU WISH  TO L
IST YEAR TO DATE THROUGH.":PRINT
:INPUTA:IF A<1 OR A>12 THEN11600
11610 GOSUB11960:GOSUB11950:GOSU
B11980:GOSUB11985:GOSUB11700:
11615 CLS:PRINT@128,"I AM PRINTI
NG YEAR TO DATE DATA.":GOTO11520
11650 IF YRSW=1 THEN 11660 ELSE
PRINT#-2,"  ACTUAL VS. BUDGET FO
R ";MO$(MO);YEAR:RETURN
11660 PRINT#-2,"   YEAR TO DATE A
/O ";MO$(MO);YEAR:RETURN
11699 GOSUB11700:GOTO11800
11700 CLS:PRINT@96,"THE 1ST PRIN
T LINE SHOULD BE    ABOUT 3/4 IN
CHES FROM THE TOP   OF PAPER. PL
EASE ALIGN. WHEN    PAPER IS ALI
GNED PROPERLY TYPE  <YES> IN RES
PONSE TO QUESTION.":PRINT:PRINT"
IS PRINTER READY";:INPUTA$:IFA$=
"YES"THENRETURNELSE11700
11800 I=1:LC=0:CLS:PRINT@98,"PRI
NTING CHART OF ACCOUNTS.":OPEN "
D",#1,"CHRTACCT/DAT",30
11810 PRINT#-2,"            ACT  <
--D E S C R I P T I O N-->":PRIN
T#-2:
11820 GET#1,I:INPUT #1,DESC$:D$=
MID$(DESC$,1,5):IFD$="XXXXX"THEN
11825ELSEPRINT#-2, USING"%
  %###%%%
     %";"            ";I;"  ";DES
C$:LC=LC+1:I=I+1:IFLC=50THENGOSU
B11880ELSEIFI=101THEN11889ELSE11
820
11825 I=I+1:IFI=101THEN11889ELSE
11820
11830 GOTO11810
11880 FORX=1TO14:PRINT#-2:NEXTX:
LC=0:RETURN
11889 LC=LC-4
11890 FOR X=LC TO 59:PRINT#-2:NE
XTX:LC=0:CLOSE#1:GOTO160
11900 GET#1,I:INPUT#1,ACNO,MO,DA
,YR,CHK,AMT,PRP$,PST:RETURN
11910 PRINT#-2:LC=LC+1:IFLC=59TH
EN160ELSE11910
11950 CLS:PRINT@96,"ONE MOMENT P
LEASE, I AM LOADING ACCOUNT DESC
RIPTIONS.":OPEN "D",#1,"CHRTACCT
/DAT",30:FORI=1TO100:GET #1,I:IN
PUT #1,DESC$:DA$(I)=DESC$:NEXTI:
CLOSE #1:RETURN
11960 CLS:PRINT@128,"I AM CHECKI
NG TO SEE IF THE DATAFOR THE MON
TH YOU SELECTED IS ONFILE.":MO=A
:OPEN "D",#1,"FILENAME/DAT",21:F
ORI=1TO12:GET #1,I:INPUT #1,YEAR
,FLE$:FL$(I)=FLE$:NEXTI:CLOSE#1
11965 IF FL$(MO) = "ZZZZZZZZ/ZZZ
" THEN 11970 ELSE RETURN
11970 PRINT:PRINT"DATA FOR THE M
ONTH YOU ENTERED  IS NOT ON FILE
. I AM RETURNING  TO MENU.":FORT
=1TO3000:NEXT T:IF DLSW=1 THEN 1
2030 ELSE 11000
11980 CLS:PRINT@98,"I AM LOADING
 BUDGET DATA.":OPEN "D",#1,"BUDG
ET/DAT",128:FORI=1TO100:GET #1,I
:INPUT #1,YEAR:FORX=1TO12:INPUT
#1,BAMT(X):NEXTX:IF YRSW=1 THEN1
1982ELSECTOT(I)=BAMT(MO)
11981 NEXTI:CLOSE#1:RETURN
11982 FOR II=1 TO MO:CTOT(I)=CTO
T(I)+BAMT(II):NEXT II:GOTO11981
11985 CLS:PRINT@96,"I AM LOADING
 ACTUAL DATA.":OPEN "D",#1,"TRAN
SFLE/DAT",128:FORI=1TO100:GET#1,
I:INPUT#1,YEAR:FORX=1TO12:INPUT#
1,TAMT(X):YTOT(I)=YTOT(I)+TAMT(X
):NEXTX:IF YRSW=1 THEN11987ELSE
TTOT(I)=TAMT(MO)
11986 NEXTI:CLOSE#1:RETURN
11987 FOR II=1 TO MO: TTOT(I)=TT
OT(I)+TAMT(II):NEXT II:GOTO11986
12000 CLS:PRINT@128,"I AM LOADIN
G MAIN PROGRAM.":RUN"EXPTRAKR"
13000 TRSW=1:RN$="ACTUAL":GOSUB1
1950:FORX=1TO12:TAMT(X)=0:NEXTX:
GOSUB11700:OPEN "D",#1,"TRANSFLE
/DAT",128:I=1:LC=0:ACNO=I:GOTO11
310
18000 CLS0:PRINT@192,"SO LONG TI
LL NEXT TIME. MAY ALL YOUR EXPEN
SES BE SMALL.":PRINT:END
```

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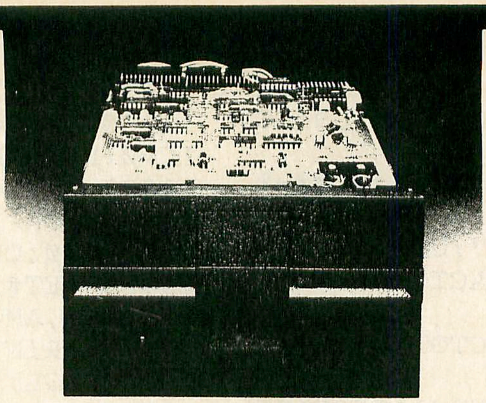

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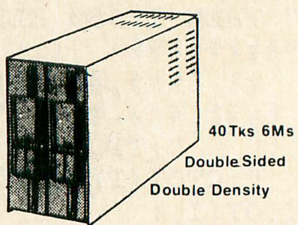

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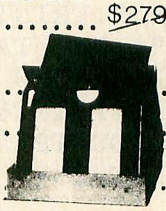

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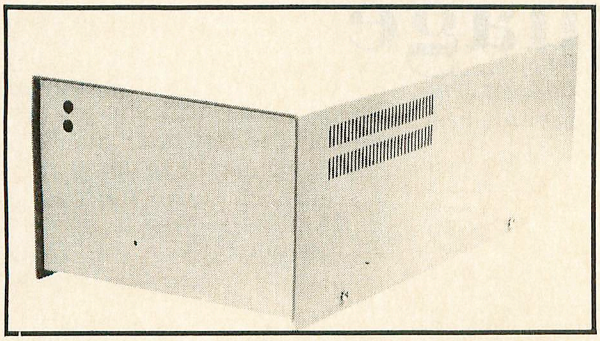

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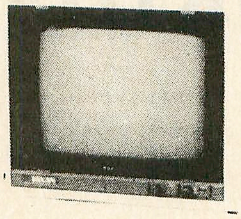

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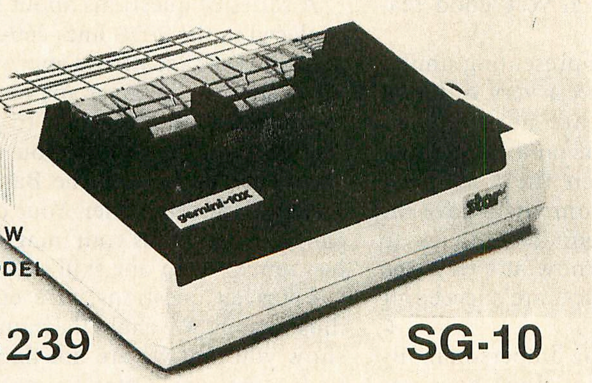

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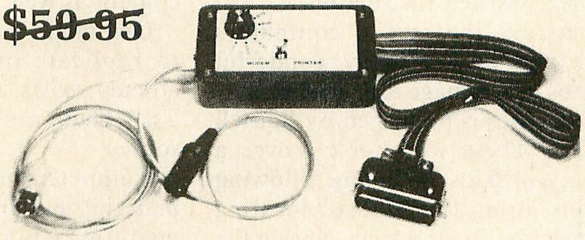

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EDUCATION NOTES

16K ECB

Building Language Arts Skills

By Steve Blyn
Rainbow Contributing Editor

"Back to basics" skills are the trend in many school systems throughout the country. This renewed emphasis on the traditional language arts and math skills is probably the most popular way computers are currently being used in schools. These types of programs are commonly referred to as C.A.I. — Computer-Assisted Instruction.

Way before the age of computers arrived, there existed many wonderful skill series of language arts workbooks. One such series is published by Barnell Loft, Ltd. These workbooks cover a wide range of skills, including following directions, using the context, locating the answer, getting the facts, getting the main idea and drawing conclusions. The individual booklets are available for the first grade up to high school level.

Almost every school I have visited uses some of these skill booklets. I have used them in my classroom for several years. This month's program is an all-purpose language arts program. It is easily adaptable to any of the ideas presented in such skill books.

By varying the types of questions, this program can be geared to any of the mentioned skill areas. Similarly, the program can be made suitable for almost any level by changing the story content as well as the questions.

One might ask, "Why is it necessary to replicate on the computer what already exists in booklet form?" Tsk! Tsk! There are several very good reasons.

Computers may be presenting similar material, but through a very different medium. Children are naturally attracted to computers and sometimes learn better through them than by traditional means. Computers have the ability to give immediate feedback to the student — you know at every step of the way whether you are succeeding or not.

Computers are also impersonal. By that, I don't mean they don't have any personality. Morris, my original CoCo, is very dear to me and has practically become a family member. (We do celebrate his birthday.) By impersonal, I mean they are tireless reformers of mistakes. They do not complain to the user, nor do they make any judgments against the user. It is almost impossible for a person to remain impartial to successes and failures as computers do.

The program presents part of the "Jack and the Beanstalk" story. This is located on lines 90 and 100. Our story is merely used as an example. The choice of story and the grade level for which it is written should be yours. The story of Jack was taken from a third-grade reader.

A series of questions about the story is placed in the DATA lines 260-390. Our questions use a scattered approach: They purposely do not cover any one specific skill area. They are meant to illustrate the variety of questions you may use. They even go beyond the Barnell Loft areas mentioned earlier. Your questions can be as diverse as your imagination or just remain with one skill area.

Fourteen questions were entered as illustrations. We chose the number 14 to show you that we are not limited only to 10 questions. Often, computer newcomers think there is something magical about the number 10 or its multiples. Not so! A short program such as this one can have literally hundreds of questions entered. You must, however,

---

Steve Blyn teaches both exceptional and gifted children, holds two master's degrees and has won awards for the design of programs to aid the handicapped. He owns Computer Island and lives in Staten Island, New York.

tell the computer how many questions to read. Our number of questions is indicated in the dimension statement on Line 30 and also on lines 40 and 50. Be sure to include the number of questions you use on those lines.

The program is set to ask 10 of the story questions each round. Common sense dictates that rounds come in sets of 10 questions. Other numbers that divide evenly into 100 are also good choices. The questions appear one at a time and do not repeat in a given round.

Correct answers receive a happy tune and a message that says "correct" on Line 210. The incorrect answers, however, are really the important ones. Each time a question is answered incorrectly, its question and correct answer are stored in lines 400-420. This makes possible a review of these questions and answers. This is similar to a study-review sheet.

The program handles the review on lines 430-480. If you have a printer, it is a good idea to print out the review for the student's future reference. To get a printout, change the `PRINT` statements on lines 430, 440 and 460 to `PRINT#-2,` statements. You may add these to the existing lines to get the output on both the screen and the printer.

It is hoped that you use this program as a model for incorporating your own versions. You may create fun programs to reinforce children's favorite stories or programs to strictly strengthen specific language arts skills. A combination of the two might be the best route to go. Remember to save each of your versions on tape or disk before proceeding to your next creation. ☐

160 134
340 253
END 100

The listing: `FINDWORD`

```
10 REM"FIND THE WORD"
20 REM"STEVE BLYN,COMPUTER ISLAN
D,NY,1986
30 DIM A$(14),B$(14),X$(10),Y$(1
0)
40 FOR T=1 TO 14:READ A$(T),B$(T
):NEXT T
50 R=RND(14)
60 XY=RND(-TIMER)
70 CLS
80 PRINT@32,STRING$(32,207);
90 PRINT"   JACK CLIMBED THE BEA
NSTALK A SECOND TIME. HE WAS AGA
IN HELPEDBY THE GIANT'S WIFE. TH
IS TIME  HE TOOK THE HEN THAT LA
ID THE    GOLDEN EGGS. HE ESCAPED
 QUICKLY.";
100 PRINT"  JACK PICKED UP THE M
AGIC HARP ON HIS THIRD TRIP. BUT
 THE HARP CALLED OUT AND WOKE TH
E GIANT.  THE GIANT BEGAN TO CHA
SE JACK."
110 N=N+1
120 PRINT@0,"N=";N;"     **  JA
CK  **   R=";CR;
130 IF N>10 THEN GOTO 430
140 PRINT@352,STRING$(32,(RND(12
8)+127));
150 PRINT@416,STRING$(95," ");
160 PRINT@384,"TRY TO FIND THE W
ORD THAT..."
170 IF R>13 THEN R=0
180 R=R+1
190 PRINTA$(R)
200 INPUT C$
210 IF C$=B$(R) THEN PLAY"L100CE
GCEGCC":PRINT"CORRECT. PRESS ENT
ER TO GO ON";:CR=CR+1
220 IF C$<>B$(R) THEN PLAY "L4CC
":PRINTB$(R)" IS THE ANSWER.";:G
OSUB 400
230 EN$=INKEY$
240 IF EN$=CHR$(13) THEN 110
250 GOTO 230
260 DATA IS A COMPOUND WORD,BEAN
STALK
270 DATA IS A COLOR,GOLDEN
280 DATA HAS AN APOSTROPHE,GIANT
'S
290 DATA IS THE OPPOSITE OF HUSB
AND,WIFE
300 DATA IS GOOD TO EAT FOR BREA
KFAST,EGGS
310 DATA MEANS MORE THAN TWO TIM
ES,THIRD
320 DATA MEANS THE OPPOSITE OF S
MALL,GIANT
330 DATA MEANS THE SAME AS FAST,
QUICKLY
340 DATA MEANS THE SAME AS A VOY
AGE,TRIP
350 DATA IS THE NAME OF AN ANIMA
L,HEN
360 DATA IS A MUSICAL INSTRUMENT
,HARP
370 DATA IS THE OPPOSITE OF IN,O
UT
380 DATA THAT APPEARS MOST OFTEN
 ABOVE,THE
390 DATA THAT IS USED 4 TIMES,JA
CK
400 X$(J)=A$(R):Y$(J)=B$(R)
410 J=J+1
420 RETURN
430 CLS:PLAY"CDEFG":PRINT"HERE I
S YOUR REVIEW"
440 IF CR=10 THEN PRINT:PRINT"VE
RY GOOD ... 100%":GOTO 490
450 FOR K=0 TO J-1
460 PRINT K+1;".";Y$(K);" IS THE
 WORD THAT":PRINTX$(K):PRINT
470 EN$=INKEY$
480 IF EN$=CHR$(13) THEN NEXT K
ELSE 470
490 END
```

Educating with Electronic Communications and Research

By Michael Plog, Ph.D.
Rainbow Contributing Editor

In case you have not tried your free hour on the Delphi telecommunications network, I strongly encourage you to take advantage of this offer from THE RAINBOW. Like many of you, I have been playing around with Delphi for a while now, trying to learn the shortest way to get from one point to another.

The folks who created the Delphi system must have been poets, because the name itself implies majesty, mystery and a reference to answers. "Delphi" was a special place to the ancient Greeks. It was the most important Greek temple and home of the oracle of Apollo. Also, the Greeks considered Delphi to be the center of the world. In the temple itself, a stone marked the exact spot of the world's center, called the "navel."

The term "oracle" is actually a Latin word, not Greek. Traditionally, the oracle at Delphi belonged first to Mother Earth. Apollo either stole the oracle or was given it by Mother Earth. The medium of the oracle (the person actually doing the speaking) was always a woman over 50. The procedures to obtain an answer from the oracle were complex and rigid. A "reading" could only be given at certain times of the year. A ritual cake was required, along with a sacrificial animal conforming to rigorous physical standards.

Michael Plog received his doctorate degree from the University of Illinois. He has taught social studies in high school, worked in a central office of a school district and currently is employed at the Illinois State Board of Education.

The oracle and her consultants bathed in a special spring, drank from a sacred stream, then entered the temple. The oracle went to a basement cell in the temple, sat on a sacred tripod and chewed leaves of the laurel tree (this was Apollo's special tree). While sitting and chewing on the leaves, the oracle would speak. Her words, however, were not given directly to the person asking the question. They were interpreted and written by the priests, often in highly ambiguous verse.

Delphi has been continuously inhabited since the 14th century B.C. The height of the oracle's prestige and popularity was in the 4th century B.C.

When you stop and think about it, the present electronic Delphi is somewhat similar to the ancient oracle. People approach with a question or a need for information. It is always helpful to have a ritual cake (maybe a sandwich, but I find it easier to use a cookie). The sacrificial animal has been replaced with a plastic credit card, but still requires rigorous standards. (If you don't pay, you don't stay.) Your computer does not have to be in a basement, but you are figuratively apart from the rest of the world. The messages we receive from our electronic oracle are sometimes ambiguous.

I have learned a few things while on Delphi, other than about the system itself. It seems that everyone wants a RAINBOWfest held in a city close to where they live. Most of the Color Computer users responding to a poll have one or more disk drives. Of the 29 respondents to one poll, 75 percent of them use more than one disk operating system for their Color Computer. I have also read some interesting messages about modems and operating systems, and have obtained some public domain software.

I wonder about educational applications of Delphi for schools and students. It seems that two major applications can be expected. First is the communication potential of Delphi. You can send messages to other people (perhaps those having some special expertise) and share ideas with others of a similar interest. The second benefit for education is the research capabilities of Delphi.

The idea of communicating with other people with similar interests is important for the field of education. Several bulletin board services exist for special interest groups in education. These services connect people with similar interests and can serve many functions. For example, local school districts can send applications for special funding to state agencies or foundations by electronic means. One special interest group, educators for the handicapped, has an electronic communications service with one of the features being updates on proposed legislation. Subscribers know what is being discussed in Washington and have an ideal opportunity to contact their representatives and encourage a vote one way or the other.

Electronic research capabilities have revolutionized decision making in business and government, but not yet in schools. Delphi has a connection with a system called DIALOG, a collection of over 200 databases. Some of these are highly specialized, technical databases, such as medical experiments or legal search organizations. A person might want to know how many microcomputers were sold to schools last year; searching the appropriate database provides the answer.

The problems involved in using electronic research are generally cost and training. The price for using some of the databases can be very high. Some of the specialized databases can cost thousands of dollars per year, plus online connection time. Most schools are not willing to incur such expenses for student projects. Also, each database requires special procedures for searching. Those procedures can become complex for the untrained person.

I believe these problems will be eliminated in the near future. The procedures for specialized searching are a matter of software. Computer professionals are currently working on new languages to help the human and machine understand each other better. The cost factor may be a little more difficult to solve. It is expensive to maintain even a simple database — a lot of time is required (which must be paid for by someone). A lot of expensive equipment is also necessary to provide a database. The more people who use such systems, however, the less each will have to pay.

Will we ever reach a time when electronic communications and research are common practices for elementary and secondary students? Will we have, for example, a sixth-grade student in Florida writing a report about earthquakes, and including as part of that report, an interview with a California student who recently experienced an earthquake?

The future is unknown; our current Delphi oracles only share present information, not future happenings. However, if you or your school is using electronic communications or research, I would like to know about it. Please share your experiences and efforts. My Delphi username is MPLOG — why not drop me a line? ☐

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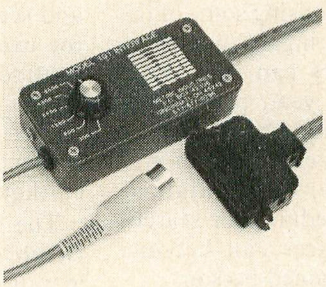

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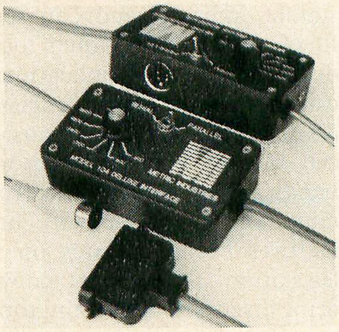

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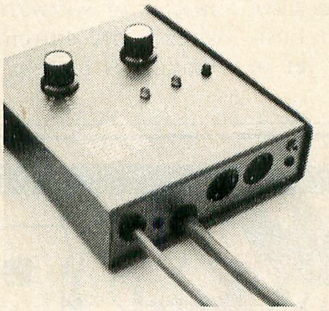

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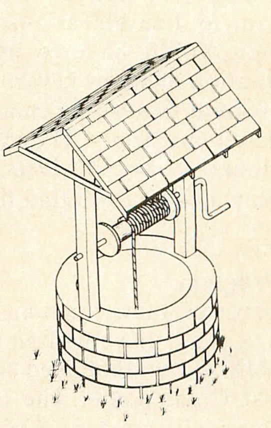
The Wishing Well Title Maker



By Fred B. Scerbo Rainbow Contributing Editor

Editor's Note: If you have an idea for the "Wishing Well," submit it to Fred c/o THE RAINBOW. *Remember, keep your ideas specific, and don't forget that this is* BASIC. *All programs resulting from your wishes are for your use but remain the property of the author.*

Some of you may have noticed that during the last 12 months the opening credits of most of my "Wishing Well" programs have taken on a slightly different look. While in the past I have used the Hi-Res graphics screens to make title cards, I haven't taken a liking to using the CHR$ colors in the text mode to create introductory title screens. Since many of you have written and requested a way to create text graphics of this style on your own, this month's "Wishing Well" will be dedicated to fulfilling this task.

The Motivation

Over a year ago, the folks at RAINBOW asked me to create a new RAINBOW ON TAPE title card. I had made the original logo back when the tape format first came out and we were looking for something a little more classy. Since at the time I had just completed a "Wishing Well" series on creating additional colors in PMODE4, I decided to use those colors for the actual graphics.

As those of you who have followed this column will recall, creating these extra colors takes a little time since the pixel patterns must be set and placed in an array. Usually, I would tie up the text screen with CLS0 so the user would not see the colors being created.

When it came time to make the RAINBOW ON TAPE logo, I felt that the user should not have to stare at a black screen for what might seem like an eternity while the graphics being created on the Hi-Res screen was kept hidden from view. Therefore, I chose to have the text screen display the words "Falsoft Inc. presents" in large block letters while this graphics manipulation took place out of sight.

For this, I used a character set that I created for my math program, *Multi-Math Driller*. However, when I included the text generator that created these large, multicolored block letters, the RAINBOW ON TAPE menu program was too long. To solve this, I used the generator to create my characters and then went through the slow process of examining the text screen memory locations to determine which CHR$ codes made up the graphics I had just created. The job took a little longer than I wanted, but the result was satisfying. In fact, it brought to mind one of the rules of programming I learned years ago: the greater the time spent by the programmer, the less the time spent by the user. (The reverse of this is also true.)

As more programs for "The Well" required title cards, I started using this technique more often. Each time, however, I streamlined the process so it would take less time. By the time I got to creating *Tri-Planetary Hangmenoids*, the character set no longer was suitable since I needed smaller, more compact letters for longer words.

This led to my writing a short routine to allow me to use the arrow keys for a simpler drawer-type program on the text screen. However, each time I created a screen, I had to go about analyzing the memory locations one line at a time. It worked, but it was slow.

The Wish

Meanwhile, many "Wishing Well" readers have kept a close watch on my title cards and asked over and over, "When will you give us a program to make title cards like these?" Some readers even wanted to use this technique for creating a string of titles to use for TV displays.

Since all of my efforts had been fractional up to this point, I finally decided to put all the pieces together in

Fred Scerbo is a special needs instructor for the North Adams Public Schools in North Adams, Massachusetts. He holds a master's in education and has published some of the first software available for the Color Computer through his software firm, Illustrated Memory Banks.

a usable program that would not only create the text and analyze the screen memory locations, but *write the final BASIC program itself!* To make the program as flexible as possible, the program would have to use both a combination of arrow keys and a direct input format that would change text to large letter characters. The end result of these wishes is *The Wishing Well Title Maker*, which you will find listed here.

The Program

Because of a few commands used by the program, I have written it to work with 16K Color Extended BASIC, and not just Color BASIC. The program it produces will work in Color BASIC, however, since the program consists only of `DATA` statements of the `CHR$` codes needed to create your screen.

The way the program works is actually quite simple. Let's say you have created a screen you wish to use. (I'll explain all the steps later.) You have two options. You may save the screen's memory locations in machine language to either disk or tape. This allows you to save a screen you have been working on and reload it later for other alterations.

Your other option, if you are satisfied with your results, is to use the "analyze" option, which will create the complete BASIC program to redraw your screen independently of the original program. The way the analyze option works is to start at the bottom line of the screen available and check all its locations to see if they are filled with black blocks of `CHR$(128)`. If the row is completely black, the program keeps moving up a row until it finds characters. This prevents us from having a really long program of `DATA` statements if only a few lines are needed.

Once the bottom row of characters is found, the program returns to the top row and analyzes each block to determine the `CHR$` code by peeking at the screen location in memory. Whatever value is found in that location, the number will have 128 subtracted from it. Later, when the number is used from `DATA`, 128 is added to it. This saves a byte here and there by keeping our `DATA` numbers as low as possible. Also, in cases where the `CHR$` is 128 (a black box), the value will end up as zero for our `DATA` line.

Rather than eat up memory by having a zero in a `DATA` line, the program will leave nothing between the commas. The new program will thus later read a zero and add 128 to it, giving us our `CHR$(128)`. This also explains why you will often see my `DATA` lines with strings of commas. These are zero values and I am simply trying to save some space. Look at the beginning of this listing and you will see what I mean.

In the analyze mode, the program writes a file in ASCII to either disk or tape. This ASCII file can later be loaded directly into memory as a BASIC program that you can add to later. You may even merge this file if you have a disk drive using the `MERGE` command. Otherwise, create a screen and then add onto your program from there.

Using the Program

Type in the program exactly as it is listed, making sure to leave out no lines or commas in the `DATA` statements. When the title screen comes up, you may press ENTER to proceed with the program. A new screen then comes up asking:

```
LOAD AN OLD FILE (Y/N) ?
```

You may press 'Y' if you wish to continue working on an old screen. If you do, you are asked to enter a filename with:

```
ENTER FILENAME:
```

which must be less than nine characters long. The program next asks:

```
FROM (D)ISK OR (T)APE ?
```

At this point, you should either have your disk in the disk drive or your tape in the cassette player with Play pushed. Failure to do this might cause an I/O Error, especially with disk.

If you have not chosen to load an old file, the screen will next say:

```
YOU MUST SELECT A FILENAME.
ENTER NEW FILENAME:
```

This filename is used later when you wish to save or analyze the screen you create. The next question to answer is:

```
(B)LANK SCREEN OR (A)UTOPRINT?
```

Autoprint allows you to enter up to four lines of text at a selected color. The internal character set in the program is used to create your screen. This method is not flawless, however, since your text cannot be over eight characters long. If the characters include M, N, W or X, then you may have to use fewer than eight characters.

You may only choose to enter one or two lines of text. When the screen says:

```
ENTER TEXT:
```

enter the words or spaces you wish to use. To center a short word such as "hello," you may wish to insert one or two spaces before the word. A space only takes up half the space of a character. You will have to experiment to get the effect desired. If you enter no text, the program will proceed to create your screen. Otherwise, you are asked to enter four lines of text.

Next you need to select the color of the characters or text to be printed. You must select the color with the numbers 1 to 8. Use this guide:

1) Green
2) Yellow
3) Blue
4) Red
5) Buff
6) Aqua
7) Magenta
8) Orange

You may not use a zero or a number larger than eight. Use the numbers listed above to select the way you want your text to look. After the text has been created, you will be in the screen editor mode.

Using the Screen Editor

If you select "blank screen" as your option, you will be in the screen editor mode. In this mode, you may use the arrow keys to draw or create your own characters. Here is a summary of the functions included:

Arrow keys — one space at a time
SHIFT-arrow — moves to that corner
1 to 8 — colors as listed earlier
9 — return to black cursor
SHIFT @ — clear the screen
* — save screen in machine language
# — analyze and create BASIC file

When you choose to analyze the screen or to save the screen in machine language, you are again asked:

```
PREPARE (D)ISK OR (T)APE
```

At this point, prepare your disk or tape and press either 'D' or 'T'.

If you have used the autoprint option, you will end up in the screen editor mode anyway. You may choose to add borders or other decorations to enhance the screen. Quite often, I will draw thin block letters using only the editor since most of my titles are over eight characters long. In fact, the actual title card for this program was created in this fashion as was the new text title page for RAINBOW ON TAPE 1986.

A few hints are needed here. The bottom line of the screen is not included in your screen design. It contains a summary of your colors and commands so you do not have to refer to this article. Also, the program is designed to use only a black background, CLS0. This is due to the way the CHR$ blocks are designed with black for the blank areas.

Also, when creating designs, it may take a little getting used to switching back and forth between a color and '9', which is black. With a little practice, you will get the hang of it. Remember, if you place some colors too close to each other, they may overlap. Once again, a little practice will help you avoid this structural limitation of the CoCo screen.

Other Pointers

I did try to include the keyboard alphanumeric characters in the editor mode but found it caused too much trouble with overall screen control. Therefore, if you must add text to a screen, do it using PRINT@ after the DATA statements in the BASIC program this *Title Maker* creates.

Also, keep in mind that if you load an old screen filename, that filename will be used to write the new file to disk or tape. This does not cause a problem with the ASCII file or machine language file having the same name, but if you are altering an existing machine language file, the new one you save will overwrite the old. You may avoid this simply by using different disks for loading and saving, or by using RENAME independent of the program.

You can string a group of these title cards together using Disk BASIC's MERGE command. You may also do the same with tape by renumbering each file, resaving it in ASCII and loading it into a tape-based word processor. Be sure to use FOR/NEXT delays (i.e., FOR I=1 to 2000:NEXT) to keep your screens from flipping by too quickly. You be the judge of how you want these to work. Your only limitation is the amount of free memory left.

One last point should be included here. If you wish to have the program file written so the DATA statements will actually be the ASCII values of the CHR$ that form the screen images, change the value of SW in Line 10 to zero (0). SW stands for "short way," which is using empty commas to save memory.

Conclusion

I hope you find this program useful. It did prove to be a bit of a challenge putting all these pieces together in a user-friendly format. Sure, it could be friendlier, but it is still much better than working in BASIC fragments or programming from scratch. I do know one thing for sure, however! Even I will enjoy being able to create titles for future "Wishing Well" articles with greater ease than I have been used to in the recent past.

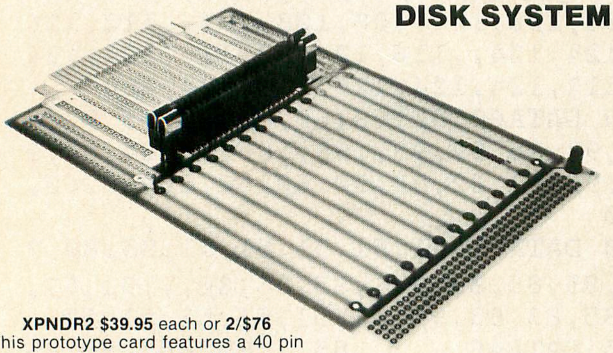
See you next month. ☐

50	136	520	12
100	60	635	90
180	45	750	212
285	199	END	234
365	56		

The listing: TITLEMKR

```
1 REM *************************
2 REM *   THE WISHING WELL    *
3 REM *      TITLE MAKER      *
4 REM *   BY FRED B.SCERBO    *
5 REM *    60 HARDING AVE.    *
6 REM * NORTH ADAMS,MA 01247 *
7 REM *  COPYRIGHT (C) 1985   *
8 REM *************************
10 CLS0:FORI=1TO384:READA:PRINTC
HR$(A+128);:NEXT:SW=1
15 DATA14,14,10,13,,14,4,14,12,1
0,,20,26,,30,20,30,21,28,29,20,2
6,21,24,29,24,29,16,30,21,28,29
20 DATA,10,,5,3,10,,11,2,,,,26,2
6,26,,26,21,19,19,16,27,23,,21,,
21,25,26,21,17,19
25 DATA,10,,5,,10,,10,,2,,,26,26
,26,,26,17,16,21,,26,21,,21,,21,
,26,21,16,21
30 DATA4,12,,12,,12,4,12,12,8,,,
28,28,24,20,28,20,28,28,20,24,20
,24,28,24,28,20,28,20,28,28
35 DATA109,,101,104,109,108,106,
109,104,96,109,104,16,,,126,125,
124,122,116,126,,126,125,124,122
,125,120,,125,124,125
40 DATA101,101,101,,101,99,,101,
,,101,,96,,,,117,,,,122,,,117,,,
117,,,117,115,114
45 DATA101,101,101,,101,,98,101,
96,106,101,,106,,,,117,,,,122,,,
117,,,117,,122,117,,113
50 DATA100,108,108,,108,108,104,
108,108,104,108,108,104,,112,116
,124,124,,116,124,80,116,124,124
,112,124,124,120,124,124,124
55 DATA60,60,60,60,60,60,85,92,9
4,93,85,92,93,,93,,86,88,84,94,9
2,90,93,92,92,90,60,60,60,60,60,
60
60 DATA51,51,51,51,51,51,85,80,9
0,85,85,83,87,,85,86,80,,,91,82,
,85,83,83,90,51,51,51,51,51,51
65 DATA48,,,,,,85,,,85,85,,85,,8
5,84,82,80,,90,,82,85,,89,,,,,,,
48
70 DATA60,60,60,60,60,60,84,48,,
84,84,,84,80,92,80,84,88,84,92,9
2,88,92,88,80,88,60,60,60,60,60,
60
75 PRINT@422,"  BY FRED B.SCERBO
  ";
80 PRINT@454," COPYRIGHT (C) 198
5 ";
85 IFINKEY$<>CHR$(13)THEN85
90 CLS:PRINT@132,"LOAD AN OLD FI
LE (Y/N) ?"
95 X$=INKEY$:IFX$="Y"THEN100ELSE
IFX$="N"THEN125ELSE95
```

```
100 PRINT:PRINTTAB(4);"ENTER FIL
E NAME: ";:LINEINPUT G$:IF LEN(G
$)>8 THEN90
105 PRINT:PRINTTAB(4)"FROM (D)IS
K OR (T)APE ?";
110 X$=INKEY$:IFX$="T"THEN115ELS
EIFX$="D"THEN120ELSE110
115 CLOADM G$:F$=G$:GOTO530
120 LOADM G$:F$=G$:GOTO530
125 CLS:PRINT@130,"YOU MUST SELE
CT A FILE NAME."
130 PRINT:PRINT"  ENTER NEW FILE
 NAME: ";:LINEINPUT F$:IF LEN(F$
)>8 THEN 130
135 PRINT:PRINT" (B)LANK SCREEN
OR (A)UTOPRINT?"
140 X$=INKEY$:IFX$="B"THEN525ELS
EIFX$="A"THEN145ELSE140
145 CLS:PRINT@231," PLEASE STAND
 BY ";
150 DIM A(45,9),B(4,12),K(8)
155 FORI=1TO8:K(I)=D:D=D+16:NEXT
I
160 FORI=2TO11:FORY=1TO9:READ A$
:A(I,Y)=ASC(A$)+63:NEXTY,I
165 FORI=19TO44:FORY=1TO9
170 READ A$:IFA$=""THEN A(I,Y)=0
:GOTO180
175 A(I,Y)=ASC(A$)+63
180 NEXTY,I
185 FORI=1TO4:FORY=1TO12:READ A$
:B(I,Y)=ASC(A$)+63:NEXTY,I
190 CLS:PRINT"FIRST TEXT LINE (8
 CHARACTERS)."
195 FORY=1TO4
200 PRINT"ENTER TEXT: ";:LINEINP
UT W$(Y):IF W$(Y)=""THEN215
205 PRINT"ENTER COLOR #: ";:INPU
TQ(Y)
210 PRINT:NEXTY
215 K=32:CLS0
220 FORII=1TO Y-1:L=K:W$=W$(II):
C=K(Q(II)):GOSUB230:K=K+96:NEXTI
I
225 GOTO530
230 P=LEN(W$):FORZ=1TOP:I=ASC(MI
D$(W$,Z,1))-46
235 IFI=31THEN245ELSEIFI=32THEN2
50ELSEIFI=41THEN255ELSEIFI=42THE
N260ELSEIFI=-14THEN265
240 GOSUB275:GOTO270
245 I=1:GOSUB300:GOTO270
250 I=2:GOSUB300:GOTO270
255 I=3:GOSUB300:GOTO270
260 I=4:GOSUB300:GOTO270
265 L=L+2
270 NEXT:RETURN
275 PRINT@0+L,CHR$(A(I,1)+C)CHR$
(A(I,2)+C)CHR$(A(I,3)+C);
280 PRINT@32+L,CHR$(A(I,4)+C)CHR
$(A(I,5)+C)CHR$(A(I,6)+C);
285 PRINT@64+L,CHR$(A(I,7)+C)CHR
$(A(I,8)+C)CHR$(A(I,9)+C);
290 L=L+4:RETURN
295 GOTO295
300 PRINT@0+L,CHR$(B(I,1)+C)CHR$
(B(I,2)+C)CHR$(B(I,3)+C)CHR$(B(I
,4)+C);
305 PRINT@32+L,CHR$(B(I,5)+C)CHR
$(B(I,6)+C)CHR$(B(I,7)+C)CHR$(B(
I,8)+C);
310 PRINT@64+L,CHR$(B(I,9)+C)CHR
$(B(I,10)+C)CHR$(B(I,11)+C)CHR$(
B(I,12)+C);:L=L+5:RETURN
315 PRINT@Q,CHR$(154);:PRINT@Q+3
0,CHR$(145)CHR$(128)CHR$(154)CHR
$(145);:PRINT@Q+63,CHR$(153)CHR$
(155)CHR$(152);:PRINT@Q+96,CHR$(
152);:RETURN
320 FORI=1TO1500
325 IFPEEK(339)=254THEN330ELSEIF
INKEY$=""THENNEXT
330 RETURN
335 DATAH,M,L,P,A,P,E,M,I
340 DATAB,P,A,A,P,A,E,M,I
345 DATAO,M,L,D,M,B,M,M,M
```



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```
350 DATAM,M,L,M,M,P,M,M,I
355 DATAP,F,K,M,N,O,A,E,I
360 DATAP,M,M,M,M,P,M,M,M
365 DATAP,M,M,P,M,P,M,M,M
370 DATAO,M,P,A,H,I,E,I,A
375 DATAP,M,P,P,M,P,M,M,M
380 DATAP,M,P,M,M,P,M,M,M
385 DATAH,M,L,P,M,P,M,A,M
390 DATAP,M,L,P,M,L,M,M,I
395 DATAP,M,M,P,A,A,M,M,M
400 DATAP,M,L,P,A,P,M,M,I
405 DATAP,M,M,P,M,M,M,M,M
410 DATAP,M,M,P,M,M,M,A,A
415 DATAP,M,M,P,E,P,M,M,M
420 DATAP,A,P,P,M,P,M,A,M
425 DATAE,P,I,A,P,A,E,M,I
430 DATAM,N,O,A,F,K,M,M,I
435 DATAP,B,O,P,N,C,M,A,M
440 DATAP,A,A,P,A,A,M,M,M
445 DATA,,,,,,,,,,,,,,,,,
450 DATAP,M,P,P,A,P,M,M,M
455 DATAP,M,P,P,M,M,M,A,A
460 DATAP,M,P,P,B,P,M,M,O
465 DATAP,M,P,P,N,C,M,A,M
470 DATAP,M,M,M,M,P,M,M,M
475 DATAM,P,M,A,P,A,A,M,A
480 DATAP,A,P,P,A,P,M,M,M
485 DATAL,A,H,N,D,O,A,M,A
490 DATA,,,,,,,,,,,,,,,,,
495 DATAL,A,H,E,P,I,A,M,A
500 DATAM,M,P,D,M,A,M,M,M
505 DATAP,C,B,P,P,E,I,P,M,A,A,M
510 DATAP,L,A,P,P,E,L,P,M,A,E,M
515 DATAP,A,A,P,P,G,J,P,E,I,E,I
520 DATAN,C,B,O,B,G,J,C,M,A,A,M
525 CLS0
530 R$=CHR$(128):PRINT@481,"";:F
ORI=143TO255STEP16:PRINTCHR$(I)R
$;:NEXT
535 Q=48:FORI=1504TO1520STEP2:Q=
Q+1:POKEI,Q:NEXTI:POKEI,42:PRINT
@497,R$;
540 PRINT@499,"save"R$R$"analys"
;:POKE1528,35:POKE1535,5
545 A$="PAGE"
550 C=0:H=0:V=0
555 X$=INKEY$:IFX$=""THEN555
560 IFX$=CHR$(8)THENH=H-1
565 IFX$=CHR$(9)THENH=H+1
570 IFX$=CHR$(10)THENV=V+1
575 IFX$=CHR$(94)THENV=V-1
580 IFX$=CHR$(95)THENV=0
585 IFX$=CHR$(91)THENV=29
590 IFX$=CHR$(21)THENH=0
595 IFX$=CHR$(93)THENH=63
600 IFX$="*"THEN655
605 IFX$="#"THEN675
610 IFX$=CHR$(19)THEN525
```

```
615 IFH<0THENH=0
620 IFV<0THENV=0
625 IFH>63THENH=63
630 IFV>29THENV=29
635 X=VAL(X$):IFX<1 OR X>9THEN64
5
640 C=X
645 IFC=9 THEN RESET(H,V):GOTO55
5
650 SET(H,V,C):GOTO555
655 GOSUB680
660 X$=INKEY$:IFX$="D"THEN670ELS
EIFX$="T"THEN665ELSE660
665 CSAVEM F$,1024,1503,0:GOTO53
0
670 SAVEM F$,1024,1503,0:GOTO530
675 GOSUB680:GOTO700
680 PRINT@480,STRING$(31,32);
685 POKE1535,143
690 PRINT@484,"PREPARE (D)ISK OR
 (T)APE ";
695 RETURN
700 X$=INKEY$:IFX$="D"THEN 705EL
SEIFX$="T"THEN710ELSE700
705 DV=1:F$=F$+"/BAS":GOTO715
710 DV=-1
715 PRINT@480," NOW ANALYSING SC
REEN LOCATIONS";
720 FOR L=1472TO1056STEP-32:ST=0
725 FORM=L TO L+31:RS=PEEK(M):ST
=ST+RS:NEXTM
730 IF ST=4096THEN NEXTL
735 REM OPEN FILE
740 OPEN"O",#DV,F$
745 PRINT#DV,"10 CLS0:FORI=1TO";
L-1024+32;":READ A:";
750 IF SW=1 THEN 760
755 PRINT#DV,"PRINTCHR$(A);:NEXT
":GOTO765
760 PRINT#DV,"PRINTCHR$(A+128);:
NEXT"
765 LN=10:FOR N=1024TO L STEP32
770 LN=LN+10:W$=STR$(LN):QW=LEN(
W$):W$=RIGHT$(W$,QW-1)+" DATA":P
RINT#DV,W$;
775 FOR M=N TO N+31:RS=PEEK(M)
780 IF SW=0THEN790
785 RS=RS-128
790 RS$=STR$(RS):QW=LEN(RS$):RS$
=RIGHT$(RS$,QW-1):IF RS$="0"THEN
 RS$=""
795 PRINT#DV,RS$;:IF M<>N+31 THE
N PRINT#DV,",";
800 NEXTM:PRINT#DV,"":NEXTN
805 PRINT#DV,"1000 GOTO1000"
810 PRINT@480,STRING$(31,32);
815 CLOSE#DV
820 GOTO530
```

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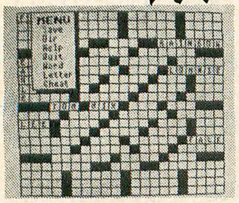

Attention all crossword puzzle addicts! Now you can solve them on your color computer! Master set contains 27 puzzles with four levels of difficulty. A pull-down menu includes such features as SAVE, HELP, WORD or LETTER GIVEN, and CHEAT. Additional sets also available. 30-plus puzzles on each set.

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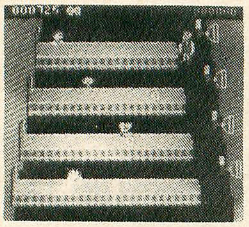
BREWMASTER



Move along the end of the bars serving beer to your thirsty customers. Watch for falling glasses and rowdy customers. Loads of fun.

REQUIRES 32K & JOYSTICK
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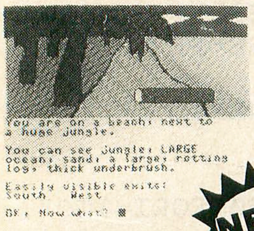
BLACKBEARD'S ISLAND



You are on a beach; next to a huge jungle.

You can see Jungle; LARGE ocean; sand; a large; rotting log; thick underbrush.

Easily visible exits:
South   West

OK, Now what?

A brand new high res graphic adventure. This one will blow your socks off! Wander around Blackbeard's Island being ever mindful of the hazards while your lust builds for Blackbeard's buried treasure. T'aint easy, matey!

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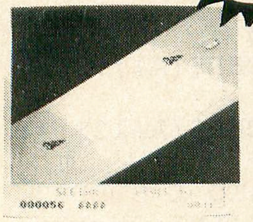
NEW!

SKYWAY



Maneuver your sky craft along the skyway avoiding enemy craft, mines and sky bugs! Jump over holes but don't run off the edge. We challenge anyone to make it through all 99 levels!

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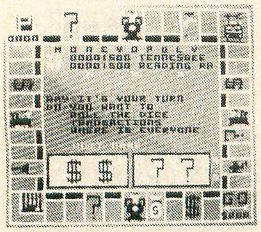
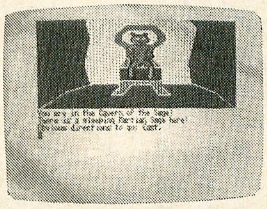
MONEYOPOLY



Now! Play this popular board game on your computer. Probably the most realistic computer board game simulation ever. Contains all the features of the original. Buy, rent or sell properties and become a wealthy land baron with this program.

REQUIRES 32K & JOYSTICK
TAPE $19.95
DISK $22.95

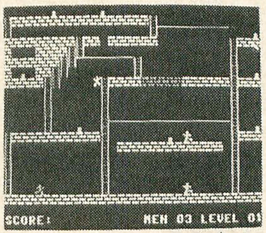
THE MARTIAN CRYPT



All new graphic adventure — Man discovers that life once existed on Mars. Can you find the hidden Martian Crypt? With sound effects to over 30 screens of animated high res graphics.

REQUIRES 32K MACHINE
TAPE $18.95
DISK $21.95

GOLD RUNNER



Travel the maze, in your never ending search for **GOLD.** But be careful! There are hidden trap doors, burly guards, tricky ladders & slippery ropes. Sounds easy you say? Clear the 1st screen and 32 more await you!

REQUIRES 64K MACHINE
JOYSTICK OR KEYBOARD
TAPE $14.95
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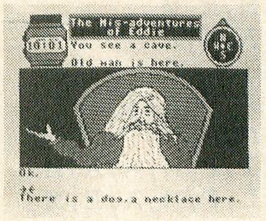
NEW!

THE MISADVENTURES OF EDDIE



You see a cave.
Old man is here.

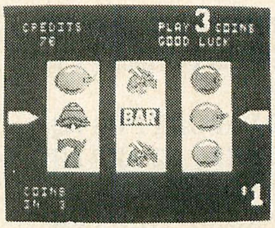
Ok.

There is a dog, a necklace here.

Another great graphic adventure!! This time you are exploring an old mine shaft when you stumble upon an old man — and into a different time! His rebellious son Eddie is roaming around time creating havoc and you must bring him home in order to return to your own time. Visit the apple orchard of Isaac Newton, the doomed Titanic — over 140 different locations and 50-plus commands! All in hi-res graphics. Only for the very adventurous and those who "enjoy being frustrated"!

REQUIRES 64K
TAPE $18.95
DISK $21.95

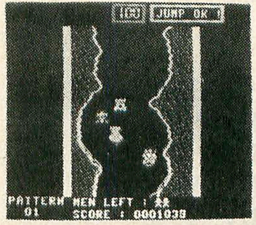
VEGAS GAME PAK



Have you ever wanted to bring Las Vegas home with you? Now you can! Six different games in this package: Blackjack, Keno, Poker, plus three other slot machine lookalikes. The only thing missing is the voice of Wayne Newton!

REQUIRES 16K EXT. BASIC
TAPE $24.95   6 games
DISK $27.95

COLOR CAR



You asked for it and now here it is! Fast-moving Grand Prix style racing. With your computer sit at the wheel of your racer through the difficult racecourse. "Bump & Jump" other cars, but be careful because they'll return the favor!

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The Joy$ of Early Amortization

By Edward R. Carson

Paying off a mortgage early to get a quicker equity buildup is the best idea I (a homeowner) have heard of in a long time. It used to cost a little extra each month to reach this goal, but a new kind of mortgage is just now taking hold in the United States that can make the process almost painless. Quicker mortgage payoff will save you a fortune in interest rates and can take years off the repayment schedule. It also has two strategic uses.

A young couple who pays off their mortgage early will then have a huge amount of equity on tap. This is also a method of forced savings; all of these gains are tax deferred. A quick payment mortgage is also suitable for middle-aged home buyers who want to own their home free and clear by the time they retire. The new way to faster home ownership is through a bi-weekly mortgage payment plan. The loan is amortized as if it were going to last for 30 years, but instead of paying once a month, one half the payment is made every two weeks. This method of repayment leads to the equivalent of 13 monthly payments rather than the usual 12. This may not sound like it would make a lot of difference, but the amount of money and time saved is astounding, as you will see when comparing Option 1 with Option 2. Since this method of repayment is not available with all lenders, two other options are included that can have the same effect and are accepted by most lenders.

There are two parts to the *Mortgage Planner.* The first part is a loan calculator. If you are planning a home purchase, the calculator figures your principal and interest payments. It returns the amount financed, amount of payment, interest rate and number of months required to retire the loan (see Figure 1). If you know the amount you want to pay per month but don't know the amount you can finance to arrive at your target payment, the calculator can help. When asked the amount to finance, just press ENTER; you are then asked the amount per month (enter what you want to pay per month) and the calculator gives the amount to finance and arrives at your target payment. You can go through as many calculations as you wish. The last amount calculated is automatically forwarded to the *Mortgage Planner.* It is not necessary to go to the calculator. If you have an existing mortgage, go directly to the Planner.

The *Mortgage Planner* has four options to choose from. Each is a different method of repayment. Three of these options can save thousands of dollars and many years off the mortgage. The

Figure 1

```
AMOUNT OF THE LOAN        $ 36000.00

NO. OF MONTHS               360

INTEREST RATE               10 %

MONTHLY PAYMENTS          $ 315.93
```

Option 1

```
YEAR        INT.PAID                    PRINCIPAL PAID
  1        $  3590.17                  $    200.94                          /
  2        $  7159.30                  $    422.92                          /
  3        $ 10705.20                  $    668.13
  4        $ 14225.42                  $    939.02                          /
  5        $ 17717.28                  $   1238.26
  6        $ 21177.82                  $   1568.84
  7        $ 24603.75                  $   1934.02                          /
  8        $ 27991.44                  $   2337.43                          /
  9        $ 31336.91                  $   2783.07
 10        $ 34635.72                  $   3275.37                          /
 11        $ 37882.99                  $   3819.21                          /
 12        $ 41073.33                  $   4419.98                          /
 13        $ 44200.78                  $   5083.64                          /
 14        $ 47258.75                  $   5816.78                          /
 15        $ 50239.96                  $   6626.68
 16        $ 53136.39                  $   7521.36                          /
 17        $ 55939.15                  $   8509.70                          /
 18        $ 58638.45                  $   9601.51
 19        $ 61223.45                  $  10807.63                          /
 20        $ 63682.17                  $  12140.01
 21        $ 66001.42                  $  13611.88
 22        $ 68166.57                  $  15237.83                          /
 23        $ 70161.51                  $  17034.00                          /
 24        $ 71968.40                  $  19018.22                          /
 25        $ 73567.57                  $  21210.16
 26        $ 74937.27                  $  23631.57
 27        $ 76053.47                  $  26306.48                          /
 28        $ 76889.64                  $  29261.42                          /
 29        $ 77416.46                  $  32525.71                          /

    YEARS             TOTAL INTEREST                          TOTAL PRINCIPAL

    30.0             $ 77733.28                              $ 36000.00
```

Edward R. Carson is a head operator at the Timken Company in Columbus, Ohio. His interests encompass computers and baseball. He is married and has three sons.

choice of on-screen or printer displays is given. The printer routine gives a year-by-year printout of interest paid, principal, paid outstanding balance, total payments, and years and months required to retire the loan. There is an on-screen bar graph of interest paid at all options. Any calculated screen can also be dumped to the printer by pressing the 'P' key. I found this easier than writing down all the information on a scratch pad. The amount of money that can be saved with just a little extra each month literally amazes me, as I am sure it will you.

(Any questions you have about *Mortgage Planner* may be directed to Mr. Carson at 7600 Condit Road, Centerburg, OH 43011, phone 614-625-6936. Please include an SASE when writing.) ☐

Option 2

```
YEAR      INT.PAID                         PRINCIPAL PAID
 1      $  3564.58                          $   542.46                    /
 2      $  7072.38                          $  1141.69                    /
 3      $ 10517.47                          $  1803.63                    /
 4      $ 13893.28                          $  2534.85
 5      $ 17192.57                          $  3342.60                    /
 6      $ 20407.32                          $  4234.89
 7      $ 23528.68                          $  5220.56                    /
 8      $ 26546.89                          $  6309.39                    /
 9      $ 29451.14                          $  7512.17
10      $ 32229.51                          $  8840.84                    /
11      $ 34868.83                          $ 10308.55
12      $ 37354.54                          $ 11929.88                    /
13      $ 39670.57                          $ 13720.89
14      $ 41799.15                          $ 15699.34                    /
15      $ 43720.67                          $ 17884.85                    /
16      $ 45413.47                          $ 20299.09                    /
17      $ 46853.60                          $ 22966.00                    /
18      $ 48014.61                          $ 25912.02                    /
19      $ 48867.30                          $ 29166.36                    /
20      $ 49379.40                          $ 32761.30                    /

YEARS      TOTAL INTEREST                    TOTAL PRINCIPAL

22.6       $ 49615.88                      $ 36000.00
```

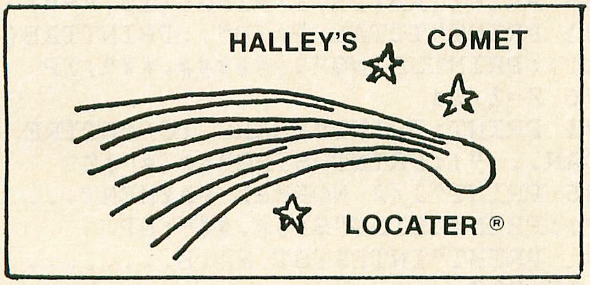
111	218	1001	207
191	141	1061	5
301	62	1111	120
391	7	1151	105
496	209	1246	206
556	1	1341	22
666	139	1441	197
771	54	1481	136
821	231	1571	240
921	242	END	83

The listing: MORTGAGE

```
1 Y=1
6 CLS
11 X=32
16 CLS
21 Z$="SAVE"
26 PRINT@X,Z$
31 X=X+10
36 IFX=382 THEN 41 ELSE 26
41 FORT=1TO80:NEXTT
46 Y=Y+1:IFY=5THEN51ELSE6
51 FORT=1TO500:NEXTT
56 CLS:PRINT@164,"the mortgage p
lanner"
61 PRINT@236,"by"
66 PRINT@294,"edward r carson"
71 GOSUB1181
76 GOTO1021
81 CLS
86 PRINT:PRINT:PRINT "YOU HAVE F
OUR OPTIONS WITH THIS PORTION OF
 THE PROGRAM..."
91 PRINT:PRINTTAB(7)"THEY ARE AS
 FOLLOWS.."
96 PRINT:PRINT:PRINT"HIT ANY KEY
 TO CONTINUE"
101 K$=INKEY$:IFK$=""THEN 101ELS
E106
106 CLS:PRINT"1) CONTINUE TO MAK
E NORMAL        MONTHLY PAYMENTS
..."
111 PRINT:PRINT"2) MAKE 1/2 OF N
ORMAL PAYMENT      EVERY 14 DAYS.
.."
116 PRINT:PRINT"3) LUMP SUM (IN
EXCESS OF NORMAL PAYMENT)  ONCE
EACH YEAR..."
121 PRINT:PRINT"4) INCREASE MONT
HLY PAYMENT BY   (X) AMOUNT...(X
) AMOUNT USED TO REDUCE BALANCE
ON A MONTHLY      BASIS"
126 PRINT"HIT ANY KEY TO CONTINU
E"
131 K$=INKEY$:IFK$=""THEN 131ELS
E 136
136 CLS:PRINT@75,"options"
141 PRINT:PRINTTAB(10)"1  2  3
4"
146 PRINT:PRINTTAB(10)"select on
e"
151 PRINTSTRING$(32,"*")
156 PRINT"1= NORMAL PAYMENT"
161 PRINT:PRINT"2= 1/2 NORMAL PA
YMENT"
166 PRINT:PRINT"3= LUMP SUM"
171 PRINT:PRINT"4= EXCESS MONTHL
Y"
176 INPUT S
181 ON S GOTO 231,546,821,841
186 CLS:PRINT@195, "what is your
 normal...."
191 PRINT@263,"monthly payment..
.."
```

```
196 INPUT NP
201 CLS:PRINT@193,"what is your
interest rate...."
206 PRINT@258,"input as per exam
ple <.0950 >"
211 INPUT AI
216 CLS:PRINT@192,"what is your
current balance.."
221 INPUT CB
226 GOTO 81
231 CLS:PRINT@260,"DO YOU WANT A
 PRINTOUT OF..."
236 PRINT@324,"YEARLY ANALYSIS..
."
241 PRINT:PRINTTAB(11)" ( Y/N )"
246 K$=INKEY$:IFK$=""THEN246
251 IFK$="Y"THEN 421ELSEIFK$="N"
THEN256
256 CLS:PRINT@196,"calculating t
otals..."
261 PRINT@260,"please stand by..
."
266 POKE 65495,0
271 DP=30.41:Z=1
276 DI=AI/365
281 IN=DI*CB*DP
286 P=NP-IN
291 PB=PB+P+EP
296 CB=CB-P
301 TP=TP+NP+EP
306 TI(S)=TI(S)+IN
311 CB=CB-EP
316 IF CB<=0THEN326ELSE321
321 IFZ=M THEN831ELSEZ=Z+1:GOTO2
81
326 TI(S)=TI(S)-CB:PB=PB+CB
331 CLS:PRINTTAB(12)"OPTION ";S
336 PRINT:PRINT"INTEREST PAID";:
PRINTTAB(21);:PRINTUSING"$######
.##";TI(S)
341 PRINT"PRINCIPAL PAID";:PRINT
TAB(21);:PRINTUSING"$######.##";
PB
346 PRINTTAB(21)STRING$(10,"-")
351 PRINT"TOTAL PAID";:PRINTTAB(
21);:PRINTUSING"$######.##";TP
356 Z=Z/12
361 PRINT:PRINT"YEARS TO RETIRE
LOAN.. ";:PRINTUSING"##.#";Z
366 PRINT"NORMAL PAYMENT........
 ";:PRINTUSING"$####.##";NP
371 PRINT"INTEREST RATE........
 ";AI;"%"
376 IFS=3GOSUB1426ELSEIFS=4GOSUB
1431
381 POKE 65494,0
```

THE ANYONE-CAN-USE



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```
386 C$=INKEY$:IFC$=""THEN386
391 IFC$="P"THENGOSUB 1381ELSE 3
96
396 IF S=4 THEN GOSUB 1246:GOTO
401
401 CB=PB:PB=0:Z=0:TB=0:TP=0:LS=
0:EP=0
406 PRINT:PRINT"DO YOU WANT THIS
 OPTION  AGAIN"
411 PRINTTAB(12)"( Y/N )":INPUT
C$:IFC$="N"THEN 136 ELSE 416
416 TI(S)=0:GOTO 136
421 CLS:PRINT@264,"now printing"
426 PRINT#-2,TAB(30)"OPTION ";S
431 IFS=3GOSUB851
436 IFS=4GOSUB856
441 PRINT#-2,"YEAR";TAB(6)"INT.P
AID";TAB(18)"PRINCIPAL PAID";TAB
(35)"TOTAL PAYMENT";TAB(51)"OUTS
TANDING BALANCE"
446 DP=30.41:Z=1:H=12:Y=1
451 DI=AI/365
456 IN=DI*CB*DP
461 P=NP-IN
466 PB=PB+P+EP
471 CB=CB-P
476 TP=TP+NP+EP
481 TI(S)=TI(S)+IN
486 CB=CB-EP
491 IFCB<=0THEN511ELSE496
496 IFZ=H THEN836ELSEZ=Z+1:GOTO4
56
501 IFCB<0THENCB=0
506 PRINT#-2,Y;:PRINT#-2,TAB(6);
:PRINT#-2,USING"$######.##";TI(S
);:PRINT#-2,TAB(18);:PRINT#-2,US
ING"$######.##";PB;:PRINT#-2,TAB
(35);:PRINT#-2,USING"$######.##"
;TP;:PRINT#-2,TAB(51);:PRINT#-2,
USING"$######.##";CB:Y=Y+1:H=H+1
2:GOTO456
511 TI(S)=TI(S)-CB:PB=PB+CB
516 PRINT#-2,""
521 PRINT#-2,TAB(5)"YEARS";TAB(1
2)"TOTAL INTEREST";TAB(28)"TOTAL
 PRINCIPAL";TAB(45)"TOTAL PAYMEN
TS"
526 PRINT#-2,""
531 Z=Z/12
536 PRINT#-2,TAB(5):PRINT#-2,USI
NG"##.#";Z;:PRINT#-2,TAB(12);:PR
INT#-2,USING"$######.##";TI(S);:
PRINT#-2,TAB(28);:PRINT#-2,USING
"$######.##";PB;:PRINT#-2,TAB(45
);:PRINT#-2,USING"$######.##";TP
541 CB=PB:TP=0:TI=0:PB=0:EP=0:LS
=0:GOTO 136
546 CLS:PRINT@260,"DO YOU WANT A
 PRINTOUT OF..."
```

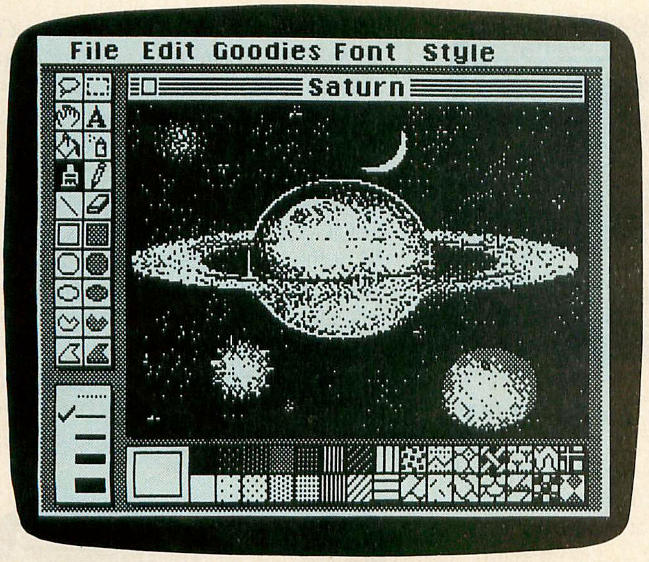
```
551 PRINT@324,"YEARLY ANALYSIS..
."
556 PRINT:PRINTTAB(11)" ( Y/N )"
561 K$=INKEY$:IF K$=""THEN561
566 IFK$="Y"THEN716ELSEIFK$="N"T
HEN581
571 ''
576 ''
581 CLS:NP=NP/2:DP=14:Z=1:H=26:Y
=1
586 POKE65495,0
591 PRINT@196,"calculating total
s..."
596 PRINT@260,"please stand by..
."
601 DI=AI/365
606 IN=DI*CB*DP
611 P=NP-IN
616 PB=PB+P
621 CB=CB-P
626 TP=TP+NP
631 TI(S)=TI(S)+IN
636 IFCB<=0THEN646ELSE641
641 Z=Z+1:GOTO606
646 TI(S)=TI(S)-CB:PB=PB+CB
651 CLS:PRINTTAB(11)"OPTION ";S
656 PRINT:PRINT"INTEREST PAID";:
PRINTTAB(21);:PRINTUSING"$######
.##";TI(S)
661 PRINT"PRINCIPAL PAID";:PRINT
TAB(21);:PRINTUSING"$######.##";
PB
666 PRINTTAB(21)STRING$(10,"-")
671 PRINT"TOTAL PAID";:PRINTTAB(
21);:PRINTUSING"$######.##";TP
676 Z=Z/24
681 PRINT:PRINT"YEARS TO RETIRE
LOAN.. ";:PRINTUSING"##.#";Z
686 PRINT"1/2 NORMAL PAYMENT....
.";:PRINTUSING"$###.##";NP
691 PRINT"INTEREST RATE........
";AI;"%"
696 POKE65494,0
701 C$=INKEY$:IFC$=""THEN 701
706 IFC$="P"THEN GOSUB 1381 ELSE
 711
711 NP=NP*2:TP=0:TI=0:CB=PB:PB=0
:GOTO 136
716 CLS:PRINT@264,"NOW PRINTING"
721 PRINT#-2,TAB(30)"OPTION";S
726 PRINT#-2,"YEAR";TAB(6)"INT.P
AID";TAB(18)"PRINCIPAL PAID";TAB
(35)"TOTAL PAYMENTS";TAB(51)"OUT
STANDING BALANCE"
731 NP=NP/2:DP=14:Z=1:H=26:Y=1
736 DI=AI/365
741 IN=DI*CB*DP
746 P=NP-IN
751 PB=PB+P
```

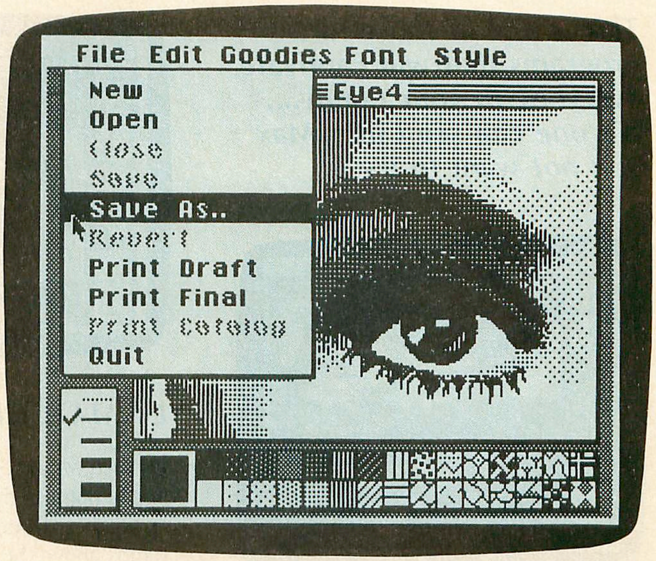
```
756 CB=CB-P
761 TP=TP+NP
766 TI(S)=TI(S)+IN
771 IF CB<=0THEN 786ELSE776
776 IFZ-H=0THEN781ELSEZ=Z+1:GOTO
741
781 PRINT#-2,Y;:PRINT#-2,TAB(6);
:PRINT#-2,USING"$######.##";TI(S
);:PRINT#-2,TAB(18);:PRINT#-2,US
ING"$######.##";PB;:PRINT#-2,TAB
(35);:PRINT#-2,USING"$######.##"
;TP;:PRINT#-2,TAB(51);:PRINT#-2,
USING"$######.##";CB:Y=Y+1:Z=Z+1
:H=H+26:GOTO 741
786 TI(S)=TI(S)-CB:PB=PB+CB
791 PRINT#-2,"":PRINT#-2,"YEARS"
;TAB(7)"TOTAL INTEREST";TAB(23)"
TOTAL PRINCIPAL";TAB(40)"TOTAL P
AYMENTS"
796 Z=Z/24
801 PRINT#-2,"":PRINT#-2,USING"#
#.#";Z;:PRINT#-2,TAB(7);:PRINT#-
2,USING"$######.##";TI(S);:PRINT
#-2,TAB(23);:PRINT#-2,USING"$###
###.##";PB;:PRINT#-2,TAB(40);:PR
INT#-2,USING"$######.##";TP
806 NP=NP*2:CB=PB:TP=0:TI=0:PB=0
811 PRINT"HIT ANY KEY TO CONTINU
E"
816 K$=INKEY$:IFK$=""THEN816ELSE
136
821 CLS:PRINT@195,"amount of lum
p sum payment":M=12
826 INPUT LS:GOTO231
831 TP=TP+LS:CB=CB-LS:PB=PB+LS:Z
=Z+1:M=M+12:GOTO281
836 CB=CB-LS:PB=PB+LS:TP=TP+LS:Z
=Z+1:M=M+12:GOTO 501
841 CLS: PRINT@192,"amount of ex
cess payment":INPUT EP
846 GOTO 231
851 PRINT#-2,TAB(25)"LUMP SUM AM
OUNT ";:PRINT#-2,USING"$####.##"
;LS:RETURN
856 PRINT#-2,TAB(22)"AMOUNT OF E
XCESS PAYMENT ";:PRINT#-2,USING"
$####.##";EP:RETURN
861 CLS:PRINT@164,"how much will
 you finance":INPUTPV
866 CLS:PRINT@164,"how many mont
hs":INPUTM
871 CLS:PRINT@163,"what is the i
nterest rate":INPUTK
876 IFK<1THEN GOTO 951
881 K=K/12:K=K/100
886 C=(1+K)^M:C=C-1
891 D=(K+1)^M:D=D*K
896 C=C/D
901 IFPV=0THENGOTO956
```

```
906 A=PV/C
911 K=K*12:K=K*100
916 CLS:PRINT@96,"AMOUNT OF THE
LOAN":PRINT@118,USING"$######.##
";PV
921 PRINT@162,"NO. OF MONTHS":PR
INT@183,M
926 PRINT@226,"INTEREST RATE":PR
INT@246,K;"%"
931 PRINT@290,"MONTHLY PAYMENTS"
:PRINT@309,USING"$####.##";A
936 S$=INKEY$:IFS$=""THEN936
941 IF S$="P"THENGOSUB 1381 ELSE
996
946 GOTO 996
951 CLS:PRINT@228,"PLEASE STATE
INTEREST RATE      AS A VALUE GR
EATER THAN 1":INPUTK:GOTO881
956 CLS:PRINT@162,"what are the
monthly payments":INPUTA
961 PV=A*C:GOTO 911
966 GOSUB 1381
971 PRINT#-2,""
976 PRINT#-2,"AMOUNT OF LOAN";:P
RINT#-2,USING"$######.##";PV
981 PRINT#-2,"MONTHS REQUIRED TO
 RETIRE LOAN";:PRINT#-2,M
986 PRINT#-2,"INTEREST RATE";K;:
PRINT#-2,"%"
991 PRINT#-2,"MONTHLY PAYMENTS";
:PRINT#-2,USING"$####.##";A
996 CLS:PRINT@224,"DO YOU WANT A
NOTHER CALCULATION"
1001 PRINTTAB(11)"(Y/N)"
1006 S$=INKEY$:IFS$=""THEN1006
1011 IFS$="Y" THEN 861 ELSE 1016
1016 CB=PV:K=K/100:AI=K:NP=A:GOT
O 81
1021 CLS:PRINT@164,"DO YOU WANT
INSTRUCTIONS":PRINT@205,"( Y/N )
"
1026 K$=INKEY$:IFK$=""THEN 1026
1031 IF K$="Y"THEN 1441 ELSE 115
6
1036 CLS:PRINT"IF YOU ARE PLANNI
NG A HOME      PURCHASE..THE LOA
N CALCULATOR   CAN DETERMINE YOU
R MONTHLY      PAYMENTS...IF YOU
 KNOW WHAT YOU CAN AFFORD PER MO
NTH,BUT DONT   KNOW THE AMOUNT Y
OU CAN FINANCE TO ARRIVE AT THIS
 PAYMENT.... "
1041 PRINT"THEN loan calculator
CAN HELP.."
1046 PRINT:PRINT"HIT ANY KEY TO
CONTINUE"
1051 K$=INKEY$:IFK$=""THEN1051EL
SE 1056
1056 CLS:PRINT"WHEN YOU ARE ASKE
```

```
D HOW MUCH YOU WILL FINANCE...JU
ST HIT <ENTER> YOU WILL THEN BE
ASKED THE      AMOUNT OF MONTHLY
 PAYMENT.ENTER WHAT YOU WANT TO
PAY PER MONTH. THE PROGRAM WILL
THEN RETURN THEAMOUNT YOU CAN FI
NANCE TO GIVE
1061 PRINT"YOU THE PAYMENTS YOU
WANT"
1066 PRINT:PRINT:PRINT"HIT ANY K
EY TO CONTINUE"
1071 K$=INKEY$:IFK$=""THEN1071EL
SE 1076
1076 CLS:PRINT"AFTER FINDING OUT
 THE AMOUNT YOUCAN FINANCE. RUN
THE"
1081 PRINTTAB(7)"mortgage saving
s"
1086 PRINT"PORTION OF THIS PROGR
AM."
1091 PRINT"IT WILL SHOW THREE WA
YS YOU CAN SAVE THOUSANDS OF DOL
LARS AND   MANY YEARS OFF YOUR M
ORTGAGE."
1096 PRINT"YOU CAN HAVE A YEARLY
 PRINTOUT  OF ANY OR ALL OPTIONS
.IT WILL   SHOW,BY YEAR,INTEREST
 PAID,TOTAL PAYMENT,CURRENT BALA
NCE AND    YEARS PAID. IT WILL T
HEN GIVE   TOTALS OF ALL ITEMS.
1101 PRINT:PRINT"HIT ANY KEY TO
CONTINUE"
1106 K$=INKEY$:IFK$=""THEN 1106E
LSE 1111
1111 CLS:PRINT"IN ORDER TO SEE A
N ON SCREEN    COMPARISON OF INT
EREST PAID     ON ALL OPTIONS, Y
OU MUST RUN    OPTION 4 LAST."
1116 PRINT:PRINT"WHEN THERE IS N
O CURSOR ON A    CALCULATED SCRE
EN YOU CAN GET A PRINTOUT BY PRE
SSING THE LETTER p ANY OTHER KEY
 WILL CONTINUE   THE PROGRAM"
1121 PRINT:PRINT"HIT ANY KEY TO
CONTINUE"
1126 K$=INKEY$:IFK$=""THEN1126EL
SE1131
1131 CLS:PRINT"THE AMOUNTS GIVEN
 IN THIS       PROGRAM SHOULD NO
T BE CONSTRUED TO BE EXACT AMOUN
TS YOU WILL PAYOR SAVE..... BUT
SHOULD BE USED ONLY AS A GUIDE T
O REPRESENT    YOUR PAYMENTS AND
 SAVINGS"
1136 PRINT"OPTION 2 OF THIS PROG
RAM MAY NOTBE ACCEPTABLE TO YOUR
 LENDER    PLEASE CHECK WITH THE
M BEFORE   ATTEMPTING THIS METHO
D.
1141 PRINT"IF YOU ARE CONSIDERIN
G A HOME   PURCHASE THIS IS AN A
TTRACTIVE  WAY TO SET UP YOUR LO
AN PAYOFF...... AS YOU WILL SEE.
1146 PRINT"HIT ANY KEY TO CONTIN
UE"
1151 K$=INKEY$:IFK$=""THEN1151EL
SE1156
1156 CLS:PRINT"DO YOU WANT TO GO
 TO THE LOAN   CALCULATOR OR TO
MORTGAGE       PLANNER"
1161 PRINT:PRINT"IF YOU CHOOSE T
HE CALCULATOR    PORTION OF THE
PROGRAM THE      LAST AMOUNTS US
ED WILL BE AUTO- MATICALLY BE EN
TERED INTO THE   MORTGAGE PLANNE
R"
1166 PRINT:PRINT"PRESS <C> FOR C
ALCULATOR AND <M> FOR MORTGAGE P
LANNER"
1171 S$=INKEY$:IFS$=""THEN 1171
1176 IF S$="C"THEN 861 ELSE 186
1181 FORL=1024TO1055
1186 POKEL,191:NEXTL
1191 L=1056
1196 POKEL,191
1201 L=L+32
1206 IFL=1504+32THEN1211ELSE1196
1211 FORL=1504TO1535
1216 POKEL,191:NEXTL
1221 L=1535
1226 POKEL,191
1231 L=L-32
1236 IFL=1055 THEN1241ELSE 1226
1241 FORT=1TO700*2:NEXTT:RETURN
1246 CLS:PRINT"DO YOU WANT TO CO
MPARE INTEREST ON ALL FOUR OPTIO
NS"
1251 PRINT:PRINTTAB(11)"(Y/N)"
1256 K$=INKEY$:IFK$=""THEN1256
1261 IF K$="Y" THEN GOTO1501ELSE
 RETURN
1266 CLS:S=1
1271 TI(S)=TI(S)*10000
1276 PRINT:PRINT"OPTION";S;:PRIN
TUSING"$######.##";TI(S)
1281 S=S+1 :IF S=5 THEN 1286 ELS
E 1271
1286 IFTI(2)<=TI(3)THEN1291ELSE1
296
1291 IFTI(2)=0THEN1296 ELSE IFTI
(2)<=TI(4)THEN1301ELSE1296
1296 IFTI(3)=0THEN 1311 ELSEIFTI
(3)<=TI(4) THEN 1306 ELSE1311
1301 TI(6)=TI(1)-TI(2):GOTO1316
1306 TI(6)=TI(1)-TI(3):GOTO1316
1311 TI(6)=TI(1)-TI(4):GOTO1316
1316 PRINT:PRINT"YOU CAN SAVE ";
:PRINTUSING"$######.##";TI(6)
```

CoCo Max


File Edit Goodies Font Style
Saturn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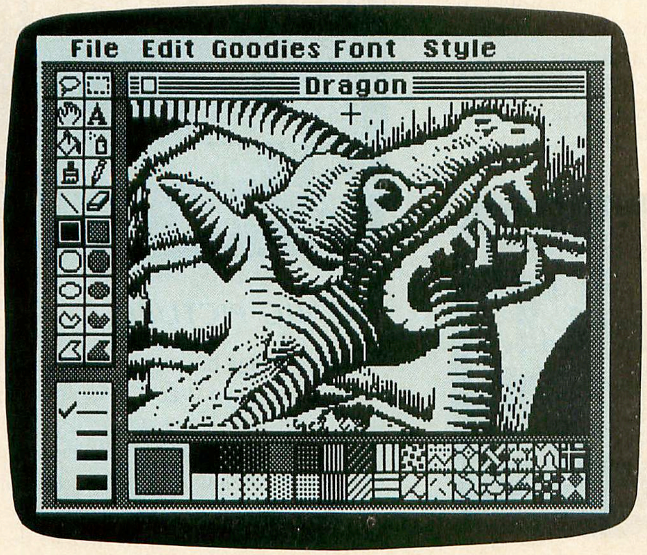
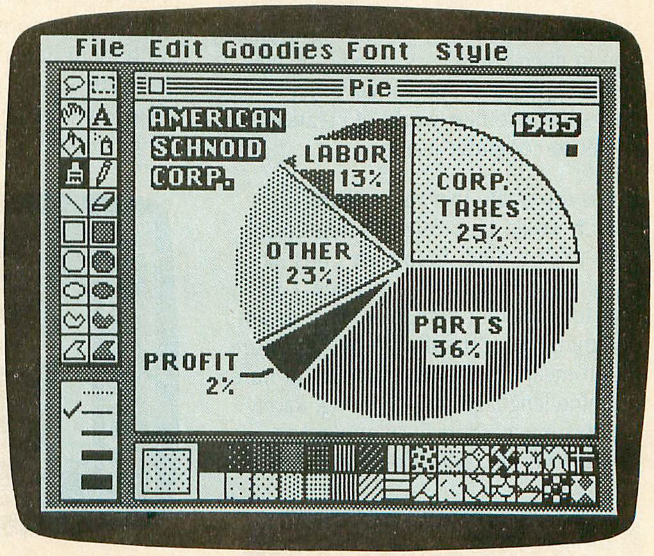

File Edit Goodies Font Style
Dragon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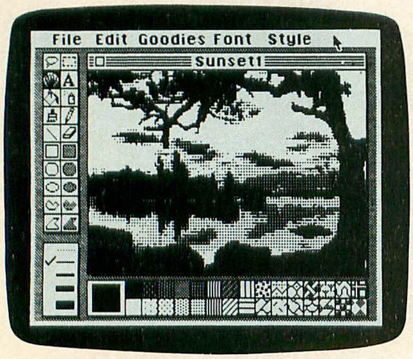
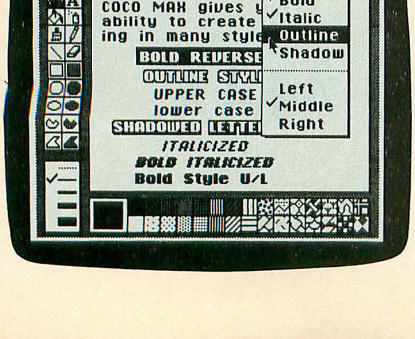
CoCo Max

This is one of those rare programs that will captivate everyone in your family.... No one can see CoCo Max and not want to try it!

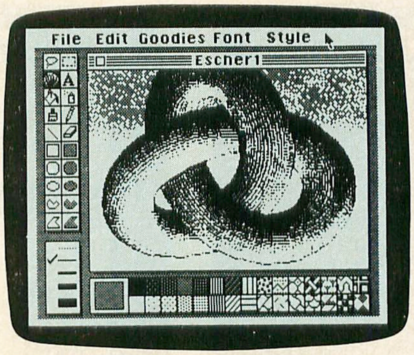

File Edit Goodies Font Style
Sunset1

We are all witnessing an exciting revolution in microcomputers: a radically new kind of computer and software that opens a whole new world of creative power to computer users.

It was inevitable that this exciting approach would be brought to the CoCo. With this in mind, Colorware chose to go all out and maximize this new concept for the color computer. That meant designing not just software but hardware too. It meant thousands of hours of pure machine language programming. Rarely has this much effort been applied to one product for the Color Computer.


File Edit Goodies Font Style
style
Plain
✓Bold
✓Italic
Outline
Shadow
Left
✓Middle
Right

COCO MAX gives y
ability to create
ing in many style
BOLD REVERSE
OUTLINE STYL
UPPER CASE
lower case
SHADOWED LETTE
ITALICIZED
BOLD ITALICIZED
Bold Style U/L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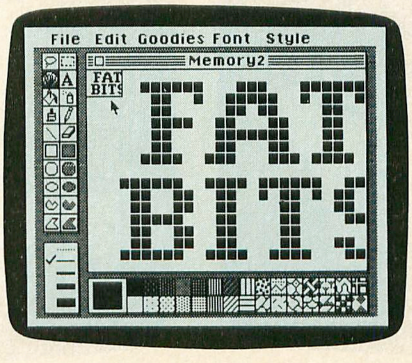
Escher1

UNMATCHED CAPABILITY...

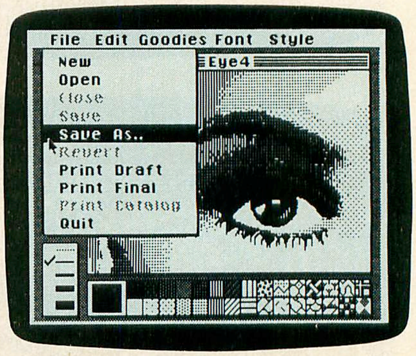
Because we took the maximum approach: highly optimized machine code combined with hardware, CoCo Max truly stands above the rest as the ultimate creative tool for the Color Computer. It's unrivaled performance lets you create with more brilliance and more speed than any similar system – much more than you ever imagined possible. And, you can do it in black & white or color.


File Edit Goodies Font Style
Memory2
FAT BITS
FAT
BITS

All the sophisticated power of the bigger systems is there: *Icons, Pull-Down Menus,* full *Graphic Editing, Font Styles,* and all kinds of handy tools and shortcuts.

Plug your joystick, mouse or touch pad into CoCo Max's Hi-Res Input Unit. Then use a delightfully simple *Point-and-Click* method to get any of CoCo Max's powerful graphic tools. It has them all:

You can *Brush, Spray* or *Fill* with any *Color, Shading* or *Pattern.* Use *Rubber Band Lines* and *Shapes* (square, rectangle, circle, elipse, etc.) to create perfect illustrations with speed and ease. There's a *Pencil,* an *Eraser* and even a selection of *Caligraphy Brushes.* And, as you can see, CoCo Max can do a lot with text.
All of the newest special effects are there: *Trace Edges, Flip, Invert, Brush Mirrors,* etc. And all of the very latest super-capabilities like: *Undo,* which automatically reverses your mistakes, and *Fat Bits* which zooms you way in on any part of your subject to allow dot-for-dot precision.


File Edit Goodies Font Style
Eye4
New
Open
Close
Save
Save As..
Revert
Print Draft
Print Final
Print Catalog
Quit

THE BIG PICTURE

The large image box in the middle of the CoCo Max screen is actually only a window on an even larger image. Use the Point-and Click "Hand" to effortlessly move your window over any portion of the larger image. You have a working area of up to 3-½ times the area of the window itself.

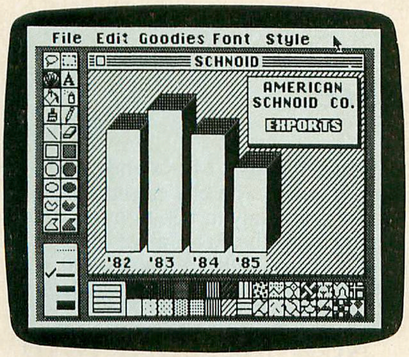
FLEXIBLE PRINTING...

CoCo Max gives you many ways to print. Fill a whole page with your image or condense two full CoCo screens to less than ¼ page for a finely detailed copy. "Dump" your CoCo Max screen full size or shrink it to ⅛ page size.

THE COCO MAX SYSTEM

FREEDOM TO CREATE...

Anyone who wants to create anything at all on their CoCo screen or printer will certainly be very glad to meet CoCo Max. CoCo Max's friendly yet sophisticated graphic and text capabilities let you almost instantly produce illustrations, diagrams, charts,



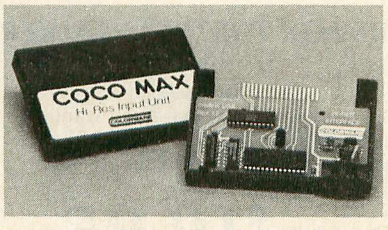
graphs, and computer art – for serious use or just for creative fun.

AN ABSOLUTE GUARANTEE

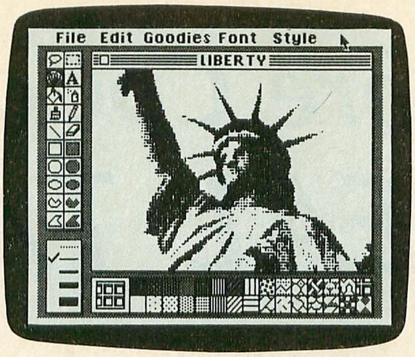
CoCo Max is a hardware/software system that no software-only system can match. Get CoCo Max and see your CoCo perform as it never could before. If you don't agree that CoCo Max is the ultimate creative tool for the Color Computer, simply return it within 20 days for a full, courteous refund from Colorware.

THE HARDWARE...

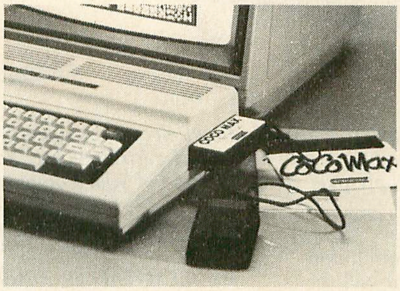
This is the key to CoCo Max's unmatched performance. Did you know the normal joystick input built into the Color Computer only allows access to 4,096 (64 x 64) points on the CoCo screen? Yet, the Color Computer's high resolution screen



has 49,152 (256 x 192) pixels. This means that a joystick, mouse or even a touch pad can, at best, only access about one tenth of the pixels on the CoCo screen. Most graphic programs ignore this hardware limitation of the Color Computer and give you only low-res control. Others attempt to overcome the limitation by using software schemes such as sliding windows. Although clever, these schemes yield sluggish and awkward results. Only CoCo Max does it the right way. The CoCo Max Hi-Res Input Unit plugs into your ROM slot and adds an entirely new joystick input to your computer – a precision one with a 49,152 point resolution to match the CoCo screen exactly.

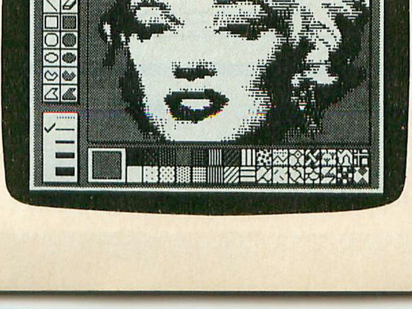


Plug your same joystick, mouse or touch pad into this new input and you have a whole new kind of control. The difference is remarkable.

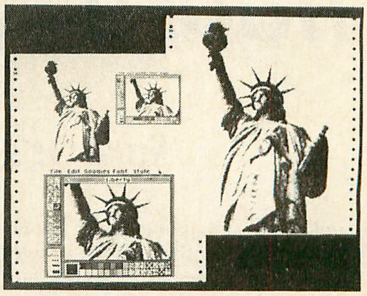


A DIGITIZER OPTION...

We studied all the video digitizers available and picked the best of them to link with CoCo Max. The DS-69 from Micro Works was our choice. This optional device lets you capture the image from any video source (video recorder, camera, etc.) on your Color Computer.



You may then use CoCo Max's graphic magic on it. The DS-69 is available as an option from Colorware from $149.95 complete with its own software on disk or tape. Using the DS-69 with a disk requires an RS multi-pak adaptor.



COCO MAX REQUIREMENTS

The CoCo Max System includes the Hi-Res Input Unit, software on disk or cassette (please specify) and user manual. It will work on any 64K Extended or non-extended Color Computer. You'll need a Radio Shack or equivalent joystick, mouse or touch pad. Disk systems require a Multi-Slot Interface or Y-Branching Cable.

THE COMPLETE COCO MAX SYSTEM, with software on *DISK*........... ***$69.95***

with software on *CASSETTE* (Available Mar '85)......................... ***$69.95***

Y-BRANCHING CABLE-If you have a disk system but do not have a Multi-Slot Interface, use this economical 40-pin, 1 male, 2 female cable to connect the CoCo Max Hi-Res input unit and your disk controller to your CoCo..... ***$27.95***

Sorry, COCO MAX is not compatible with JDOS

COLORWARE

Colorware Inc.
78-03F Jamaica Ave.
Woodhaven, NY 11421
(718) 647-2864

VISA

MasterCard

ORDERING INFORMATION

ADD $3.00 PER ORDER FOR SHIPPING AND HANDLING.
C.O.D.'S ADD $3.00 EXTRA.
SHIPPING AND HANDLING FOR CANADA IS $5.00
WE ACCEPT VISA, MASTER CARD, M.O.'S, CHECKS.
N.Y. RESIDENTS MUST ADD SALES TAX.

Why do more CoCo owners choose 'REAL TALKER'?

Sure it's priced right, but there's more...

Thousands of 'Real Talker' owners know 'Real Talker' beats ALL other Coco voice synthesizers in ease of use and flexibility. And, NO other Coco talker has a clearer, more intelligible voice. That's quite a lot of advantage when you consider Real Talker's unbeatable price. Yet, Real Talker has some important features that you simply will not find in other Coco talkers:

'SAY' command - You'll have your computer talking brilliantly in just minutes thanks to this powerful new command. Type SAY "ANYTHING YOU WANT" and your words are instantly spoken. It's that simple. Think how easy this makes creating speaking Basic programs. Adding speech to your existing programs is a snap too.

'CONVERT' - This is a truly powerful command for the basic programer. CONVERT automatically transforms a machine language dependent speaking program into a stand-alone Basic program. In other words, you can effortlessly write speaking Basic programs that do not require a machine language translator in memory. This is a unique feature of 'Real Talker'. No other voice synthesizer gives you anything even remotely approaching this type of capability - even synthesizers costing considerably more.

COLORWARE
'REAL TALKER'
INSTRUCTION
'REAL TALK
HARDWARE VOI
SYNTHESIZER
COLORWARE

'Real Talker' is a full-featured electronic voice synthesizer unit built into a compact cartridge case. You simply plug it into the side of your computer.

Other features include software controlled pitch, unlimited vocabulary text-to-speech, and even a program that will recite any ASCII file (such as from Telewriter-64 & other word processors). You also get Colorware's unique full-screen phoneme editor program that let's you experiment with and modify speech at it's most fundimental level.

'Real Talker' is compatible with any 16K, 32K, 64K Extended or non-extended Color Computer. It works with any cassette or disk system and comes complete and ready to talk through your T.V. or monitor speaker. Price includes the 'Real Talker' electronic voice synthesizer in a ROM pack, software on cassette (may be transferred to disk), and user manual.

NOW INCLUDED WITH 'REAL TALKER'........

1. *'DR. TALK*-This interactive "Eliza" type psychoanalyst program will discuss your innermost problems at length.
2. *'TALKING BATTLESHIP'*-It's you vs. the computer in this speaking version of the classic game.
3. *'TALKING BLACKJACK'*- Play for big stakes against a rather talkative casino dealer.

ONLY

$59⁹⁵

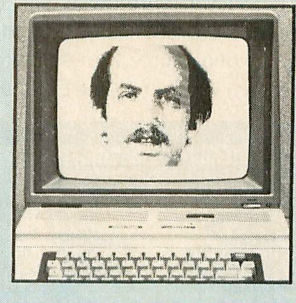
'REAL TALKER-1' (for the original Color Computer)..............***$59.95***

'REAL TALKER-2' (for the Color Computer-2)........................***$64.95***

'Y - BRANCHING CABLE' For disk systems. If you have a disk system but do not have a Radio Shack Multi-Slot unit, this economical cable will allow to connect and use your Real Talker and Disk system together...................................***27.95***

TALKHEAD

If you have a 'Real Talker', do not deprive yourself of this absolutely incredible machine-language Talking Head simulation program. While other talking head simulations use a minimal cartoon-like face, TALKHEAD uses high resolution, full-screen, digitized images of an actual person's face to create a life-like animated effect.



ACTUAL UNRETOUCHED PHOTO

SOFTWARE FOR THE 'REAL TALKER'

TALKHEAD can be easily commanded in Basic to appear on screen and say anything you want. Available on cassette or disk for only $19.95, TALKHEAD requires 64K and a Colorware 'Real Talker'.

ONLY $19.95

COLORWARE

COLORWARE INC.
78-03F Jamaica Ave.
Woodhaven, NY 11421
(718) 647-2864

VISA
MasterCard

★ ★ ★ ORDERING INFORMATION ★ ★ ★

ADD $3.00 PER ORDER FOR SHIPPING AND HANDLING.
C.O.D.'S ADD $3.00 EXTRA.
SHIPPING AND HANDLING FOR CANADA IS $5.00
WE ACCEPT VISA, MASTER CARD, M.O.'S, CHECKS.
N.Y. RESIDENTS MUST ADD SALES TAX.

```
1321 K$=INKEY$:IFK$=""THEN1321
1326 IFK$="P"THEN GOSUB 1381 ELS
E 1331
1331 PRINT:PRINT"PRESS <R> TO RE
VIEW OPTIONS AND RUN PROGRAM AGA
IN"
1336 PRINT:PRINT"PRESS ANY OTHER
 KEY TO END"
1341 K$=INKEY$:IFK$=""THEN1341
1346 IFK$="R"THEN 1366 ELSE 1351
1351 CLS:PRINT@200,"happy saving
"
1356 END
1361 GOSUB 1181
1366 S=1
1371 TI(S)=0:PB=0:Z=0:TB=0:TP=0:
LS=0:EP=0:Y=0:S=S+1:C2=0
1376 IF S=4+1 THEN 1156 ELSE 137
1
1381 ZZ=0
1386 FORXX=1024TO1535
1391 YY=PEEK(XX):ZZ=ZZ+1
1396 PP=YY AND 127
1401 IF PP>95 THENPP=PP-64
1406 PRINT#-2,CHR$(PP);
1411 IF ZZ=32 THEN PRINT#-2:ZZ=0
1416 NEXT XX
1421 RETURN
1426 PRINT"LUMP SUM AMOUNT......
. ";:PRINTTAB(21);:PRINTUSING"$#
###.##";LS:RETURN
1431 PRINT"EXCESS PAYMENT.......
";:PRINTTAB(21);:PRINTUSING"$###
.##";EP:RETURN
1436 CLS
1441 CLS:PRINT"HERE'S THE BEST I
DEA TO COME    ALONG IN QUITE A
WHILE: PAY OFF YOUR MORTGAGE FAS
TER,IN ORDER   TO GET A QUICKER
EQUTIY BUILDUP IN YOUR HOUSE.
1446 PRINT"IT USED TO COST A LIT
TLE MORE    EACH MONTH TO REACH
THIS GOAL. BUT A NEW KIND OF MOR
TGAGE THAT IS JUST TAKING HOLD I
N THE U.S. CAN MAKE THE PROCESS
ALMOST     PAINLESS.
1451 PRINT"FASTER MORTGAGE PAYME
NTS WILL   SAVE YOU A FORTUNE IN
 INTEREST  RATES.
1456 PRINTTAB(10)"HIT ANY KEY"
1461 K$=INKEY$:IFK$=""THEN1461 E
LSE 1466
1466 CLS:PRINT"THE NEW WAY TO FA
STER HOME OWNERSHIP IS THROUGH A
 BI-WEEKLY     PAYMENT PLAN. YOU
R LOAN IS      AMORTIZED AS IF I
T WERE GOING   TO LAST FOR 30 YE
ARS. BUT...    INSTEAD OF PAYING
 ONCE A MONTH, YOU MAKE 1/2  OF
THE MONTHLY"
1471 PRINT"PAYMENT EVERY TWO WEE
KS. THIS    SCHEDULE LEADS TO THE
 EQUIVALENTOF 13 MONTHLY PAYMENT
S EVERY     YEAR RATHER THAN THE
USUAL 12."
1476 PRINT"THIS MAY NOT SOUND LI
KE MUCH OF A CHANGE. BUT ITS EFF
ECT IN      CUTTING THE TIME AND
COST OF ANYMORTGAGE IS ASTOUNDIN
G."
1481 K$=INKEY$:IFK$=""THEN1481 E
LSE 1486
1486 CLS:PRINT"THIS METHOD OF RE
PAYMENT IS      option 2.YOU WILL
 SEE HOW MUCH  CAN BE SAVED WITH
 THIS OPTION   WHEN YOU COMPARE
INTEREST PAID  ON ALL OPTIONS."
1491 PRINT:PRINTTAB(10)"HIT ANY
KEY"
1496 K$=INKEY$:IF K$=""THEN 1496
 ELSE 1036
1501 CLS
1506 FOR L=1024 TO 1055
1511 POKE L,175:NEXT L
1516 L=1056
1521 S=1:X=0
1526 X=49
1531 POKE L,X
1536 L=L+64
1541 X=X+1
1546 IF X=53 THEN 1551 ELSE 1531
1551 FOR L=1280 TO 1311
1556 POKE L,175
1561 NEXT L
1566 FOR L=1025 TO 1280 STEP 32
1571 X=175
1576 POKE L,X:NEXT L
1581 PRINT@291,"X 1  5  10  15
20  25  30"
1586 PRINT@320,"INTEREST = X TIM
ES  $10,000"
1591 S=1:X=0
1596 L=1058+X
1601 TI(S)=TI(S)/10000
1606 F=FIX(TI(S))
1611 FORL=L TO L+F
1616 POKEL,191
1621 NEXTL
1626 X=X+64
1631 S=S+1:IF S=4+1 THEN 1641 EL
SE 1596
1636 POKEL,191
1641 PRINT@384,"HIT <C> TO CONTI
NUE PROGRAM "
1646 PRINT@416,"ANY OTHER KEY WI
LL END PROGRAM"
1651 K$=INKEY$:IF K$=""THEN1651
1656 IFK$="C"THEN 1266ELSE 1351
```

RAINBOW

Give us your best: Join the ranks of these courageous CoCoists in showing the Color Computer world your high score at your favorite micro-diversion. We want to put your best effort on record in THE RAINBOW's "Scoreboard" column. All entries must be received 60 days prior to publication. Entries should be printed — legibly — and must include your *full* name, address, game title, company name and, of course, your high score. Each individual is limited to three score entries per month. Send your entries to Scoreboard, c/o THE RAINBOW. The "Rainbow Scoreboard" is now a bimonthly feature.

For greater convenience, your high scores may also be sent to us through the MAIL section of our new Delphi CoCo SIG. From the CoCo SIG> prompt, pick MAIL, then type `SEND` and address to: `EDITORS`.

★ Current Record Holder ● Shutout

ANDRONE *(Radio Shack)*
54,300 ★Daphnie Phillips, Evansville, WI

ASTRO BLAST *(Mark Data)*
53,950 ★Bill Fritsch, Whitehall, PA

ATOM *(Radio Shack)*
54 ★Brent Heaton, Anderson, SC
53 Alan Drazen, Longwood, FL

BASEBALL *(Radio Shack)*
525-50 ★Bob Dewitt, Blue Island, IL
89-0 ●Skipper Taday, East Lyme, CT

BATS AND BUGS (THE RAINBOW, 7/84)
24,600 ★Michael Rosenberg, Prestonburg, KY
3,050 Jay Lose, Gulfport, MS
3,000 Michael Scott, Johnstown, NY
2,500 Steven Bullard, Allen, OK

BLACKBEARD'S ISLAND *(NOVASOFT)*
79 ★Jeff Roberg, Winfield, KS

BLACKJAK (THE RAINBOW, 4/84)
$10,000 ★Wayne Dewitt, Blue Island, IL

BLACK SANCTUM *(Mark Data)*
106 ★Jeff Hillison, Blacksburg, VA
109 Gregg Shay, Sunnymead, CA
109 James Stakelin, Cynthiana, KY

BREWMASTER *(NOVASOFT)*
279,600 ★Alan Drazen, Longwood, FL
216,350 Jean-Francois Morin, Loretteville, Quebec
166,175 Scott Purrone, Roselle Park, NJ
98,875 Chris Cope, Central, SC
78,100 Steve Leonard, Roselle Park, NJ
21,500 Joel Miller, Neenah, WI

BROTAN THE BLUE (THE RAINBOW, 8/85)
1,384 ★Michael Scott, Johnstown, NY
822 Brian Voges, Jasper, IN

BUSTOUT *(Radio Shack)*
21,850 ★Charles Egglesfield, Sault Ste Marie, Ontario
18,403 Chris Zepka, North Adams, MA
14,500 Wayne Dewitt, Blue Island, IL
13,000 Ken Dewitt, Blue Island, IL
6,500 George Frausto, Blue Island, IL

BUZZARD BAIT *(Tom Mix)*
4,455,150 ★Paul Rumrill, Gales Ferry, CT
3,091,700 Blossom Mayor, East Greenbush, NY
101,450 Jay Pribble, Davenport, IA
75,700 Paul Bullman, Rocky Mountain House, Alberta
55,450 Terry Pribble, Davenport, IA

CANYON CLIMBER *(Radio Shack)*
9,129,100 ★Gary Mohnsen, Tucson, AZ
1,004,000 Brett Fancher, Hooksett, NH
362,400 Chris Reynolds, Richmond, KY
330,400 Duane Sholter, Nipawin, Saskatchewan
286,800 Beverly Herbers, Placentia, CA
62,000 Mark Lemke, Neenah, WI
60,400 Steve Thomas, Ogdensburg, NY
42,800 Joel Miller, Neenah, WI

CASHMAN *(MichTron)*
$31,260 ★Fred Naumann, Hailey, ID
27,530 Sally Naumann, Hailey, ID
24,920 Edwin Prather, Oxnard, CA
17,850 Matt Mendez, Baltimore, MD

CLOWNS & BALLOONS *(Radio Shack)*
352,020 ★Faye Keefer, Augusta, GA
45,460 Joyce Walcott, Mt. Clemens, MI
31,770 Cameron Walcott, Mt. Clemens, MI
30,190 Jason Smith, Ellijay, GA
30,070 Paul Walcott, Mt. Clemens, MI

COLOR BASEBALL *(Radio Shack)*
707-0 ★●Chislain Chillis, Trois-Rivieres, Quebec
549-0 ●Skipper Taday, East Lyme, CT
243-0 ●Steve Mutton, Shrewsbury, MA
147-1 Alton Updike, Deltona, FL
105-0 ●Francis Yu, Calgary, Alberta

COLORPEDE *(Intracolor)*
3,107,194 ★John Ray, Goodlettsville, TN
133,036 Mariano Frausto, Blue Island, IL
59,529 Kevin Radwan, Blue Island, IL
37,560 Mark Motel, Blue Island, IL
15,056 Hiram Esparza, Blue Island, IL

COLOR POKER (THE RAINBOW, 4/83)
1,168,900 ★Earl La Jesse Foster, Lynchburg, VA

CRASH *(Tom Mix)*
25,100 ★Jean-Francois Morin, Loretteville, Quebec

CRYSTLE CASTLES *(ThunderVision)*
850,156 ★Michael Brennan, Calgary, Alberta
800,060 Dan Mitenko, Calgary, Alberta
689,751 Edwin Prather, Oxnard, CA
559,380 Jeff Dinger, Edgewood, MD
545,000 Jay Roberg, Winfield, KS
98,125 George Frausto, Blue Island, IL

DALLAS QUEST *(Radio Shack)*
90 ★Roy Grant, Toledo, OH
91 John Semonin, Akron, OH
93 Tommy McClure, Doyline, LA
93 Robert Sunderland, Sacramento, CA

DEFENSE *(Spectral Associates)*
77,345 ★Mario Brule, Pointe Aux Trembles, Quebec
56,720 Brett DuPont, Oregon, OH

DEMOLITION DERBY *(Radio Shack)*
97,600 ★Hillel Morris, Chicago, IL
88,800 Skipper Taday, East Lyme, CT
54,700 Scott Balthazor, Neenah, WI
43,100 Chris Fox, Midlothian, VA
37,000 Alexander Taday, East Lyme, CT

DEMON ATTACK *(Imagic)*
57,655 ★Tracy Salzman, LaSalle, CO
29,750 Mike McGeoch, Havertown, PA
19,445 Erik Huffman, Rochester Hills, MI
10,830 Rupert Young, Sheffield, MA

DEMON II (THE RAINBOW, 3/85)
21,925 ★Keith Schuler, Merritt Island, FL

DESERT RIDER *(Radio Shack)*
32,488 ★Erik Huffman, Rochester Hills, MI

DOODLEBUG *(Computerware)*
1,685,350 ★Caroline Cyr, Ottawa, Ontario
1,457,290 Thomas Haythornthwaite, Ottawa, Ontario
825,370 Susan Ballinger, Uxbridge, Ontario
805,010 Bill Fritsch, Whitehall, PA
585,070 Johnny Fritsch, Whitehall, PA

DOUBLE BACK *(Radio Shack)*
1,618,400 ★Diane Guernon, Montreal, Quebec
614,450 Eugene Roosa, Stone Ridge, NY
450,600 Michael Brennan, Calgary, Alberta
8,970 Curtis Taylor, Scarborough, Ontario

DRACONIAN *(Tom Mix)*
628,470 ★Jeff Coladonato, Roslyn, PA

DRAGON FIRE *(Radio Shack)*
5,827 ★Susan Coker, Austell, GA
2,885 Stevie Hice, Newton, NC
1,520 Bette Hatcher, Norwalk, CA

DRAGON SLAYER *(Tom Mix)*
44,800 ★William Futer, Bridgeton, NJ

DUNKEY-MUNKEY *(Intellectronics)*
66,900 ★Michael Drouin, Reeds Spring, MO
16,500 Baiju Shah, Deep River, Ontario
11,000 Mariano Frausto, Blue Island, IL

ELEC*TRON *(Tom Mix)*
40,650 ★Brad Gaucher, Hinton, Alberta

FALCON'S LAIR (THE RAINBOW, 8/85)
17,463 ★Michael Scott, Johnstown, NY
14,627 Alexander Taday, East Lyme, CT
12,497 Dick Teeter, Hawley, PA
8,430 Brian Voges, Jasper, IN
7,792 Steve Artmeier, Jasper, IN

FANGMAN *(Tom Mix)*
155,225 ★Daniel Thompson, St. Louis, MO

FOODWAR *(Arcade Animation)*
270,360 ★Edwin Prather, Oxnard, CA
165,960 Chris Cope, Central, SC

FOOTBALL *(Radio Shack)*
266-0 ★●Tim Hart, Salt Lake City, UT

THE FROG *(Tom Mix)*
11,080 ★Mark Ferris, Deep River, Ontario

GALACTIC ATTACK *(Radio Shack)*
33,930 ★Allison Iarosis, Owego, NY
30,870 Oren Bergman, Herzlia, Israel
19,410 Ron Volans, Ogdensburg, NY

GALAGON *(Spectral Associates)*
1,306,640 ★Jackie Maddox, Iron Station, NC

GHANA BWANA *(Radio Shack)*
218,420 ★Rupert Young, Sheffield, MA
146,930 Brian McGregor, Oshawa, Ontario
132,970 Karen Goddard, Oshawa, Ontario
128,430 Tom Gaynor, New Milford, CT
115,840 Price Wood Jr., Florence, SC

GHOST GOBBLER *(Spectral Associates)*
84,410 ★Greg Erickson, Lowell, MA
76,900 Ghislain Chillis, Trois-Rivieres, Quebec
72,960 Sylvain Castonguay, Chicoutimi, Quebec
55,120 Jeff Weeks, Wetaskawin, Alberta
47,630 Alan Drazen, Longwood, FL

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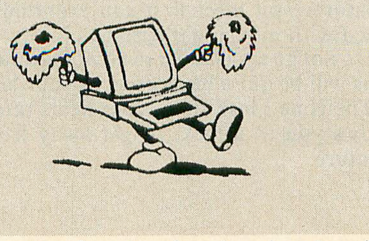

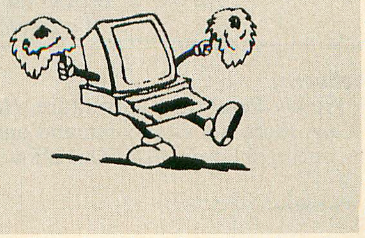

SCOREBOARD POINTERS

In conjunction with THE RAINBOW's Scoreboard, we offer this column of pointers for our game-playing readers' benefit. If you have some interesting hints and tips, we encourage you to share them by sending them to the Scoreboard, c/o THE RAINBOW.

FEEDBACK

Scoreboard:

First to Tommy McClure [December 1985, concerning *To Preserve Quandic*]: You don't use the car at all, except to get the cat. To use the helicopter, you type `RIDE HELICOPTER`.

Now to Ric Miller [December 1985, concerning *To Preserve Quandic*]: I don't like to use "attack guard," because sometimes you lose. The best thing to do is get the cat, and the guard will leave because he is allergic to cats.

Now, to Jon Olson [December 1985]: To get the flashlight in *Dallas Quest*, you type `PULL CURTAIN`.

Also, I have a few hints for *Calixto Island*. After you make both trades with Trader Jack, the teleporter will disappear. So, be sure to get everything over to the marshy field before doing the trades.

I hope all of this information has been helpful.

Kevin Holderbach
Mesa, AZ

AUTHORS' NOTES

Scoreboard:

To make *Brotan the Blue* a bit easier to play, change the following in the program:

Eliminate `PUT(CD,Y)-(CD+8,Y+11),SP:` in Line 34 and change Line 40 to read:

```
40 RR=RND(100):IF RR>50 and RR<53
THEN GOTO 50 ELSE GOTO 18
```

The red gremlins will appear less often and attaining freedom will be easier for you. Enjoy the game!

Alan A. Saporta
Author of Brotan the Blue
Woodside, NY

Scoreboard:

In Prickly-Pear's new Adventure, *Hall of the King*, there is a vital command omitted in the documentation: `PUT`. This allows you to get objects and place them in specific areas, which is necessary to solve the Adventure.

Two actions that are unnecessary to complete the Adventure are important to the overall campaign of the *Hall of the King* trilogy. First, you must get the huge glass pane and place it upon the center square after `GO`ing onto the catwalk. Then `READ` the glass pane or center square. This will give you information about the entire quest.

Second, you must find the parchment whose meaning will be divined later in the quest. This can be done by examining the desk in the study.

This is all the help I can fairly give. Good luck with solving the rest of the Adventure.

Glen Dahlgren
Author of Hall of the King
Pittsburgh, PA

RINGS ARE GOOD FOR THE IMAGE

Scoreboard:

I would like to share a few tips for *Dungeons of Daggorath*. I have killed all of the creatures except the Evil Wizard.

First, save to tape after you kill a creature and get an object.

After you have several duplicate objects, drop them in the same room you are in. When a creature enters the room, you can attack many times while he is occupied picking up the objects. The more objects you drop, the more attacks you can make.

When you kill the Image of the Evil Wizard you *must* have a new torch in use and your best sword in one hand. The contents of your backpack are lost when you kill this creature.

Save your incanted rings for use against the Image of the Evil Wizard. All other creatures you meet first can eventually be killed without using the rings.

Do not go up a ladder to escape a creature. This will be quite hazardous to your health.

The Hale Flask slows your heart rate and allows you to attack, or get away from, a creature.

The Vision Scroll allows you to see a map of the level of the dungeon you are in.

The Seer Scroll shows the position of the creatures on the dungeon map.

I hope you find these tips useful.

Daniel L. Quigg
Richmond, KY

THE VORTEX FACTOR

Scoreboard:

I recently purchased *The Vortex Factor* from Mark Data Products. It is a challenging and exciting Adventure with excellent graphics. Some tips are: When you get the key to the south door, type `OPEN DOOR` then `GO DOOR` to enter. When you get to the room with the cylinder, type `GO CYLINDER`. Type `GET CALENDAR` when you go to the main office and see what you find!

One final tip: The only way you can find objects and treasures is if you `EXAMINE` things closely.

I also have some questions. How do you open the bank? How can you make the time machine work? Is there a secret passage behind the bookcase? If anyone can answer my questions, please write to the "Scoreboard."

Tommy Crouser
Dunbar, WV

To respond to other readers' inquiries and requests for assistance, reply to "Scoreboard Pointers," c/o THE RAINBOW, P.O. Box 385, Prospect, KY 40059. We will immediately forward your letter to the original respondent and, just as importantly, we'll share your reply with all "Scoreboard" readers in an upcoming issue.

For greater convenience, "Scoreboard Pointers" and requests for assistance may also be sent to us through the MAIL section of our new Delphi CoCo SIG. From the CoCo SIG> prompt, pick MAIL, then type `SEND` **and address to:** `EDITORS`**.**

— Debbie Hartley

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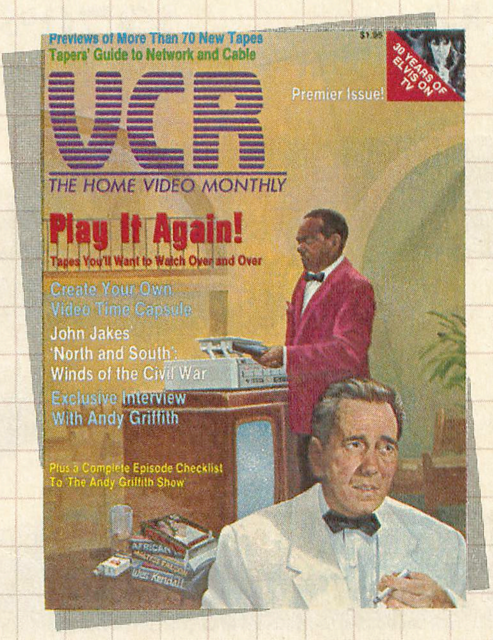
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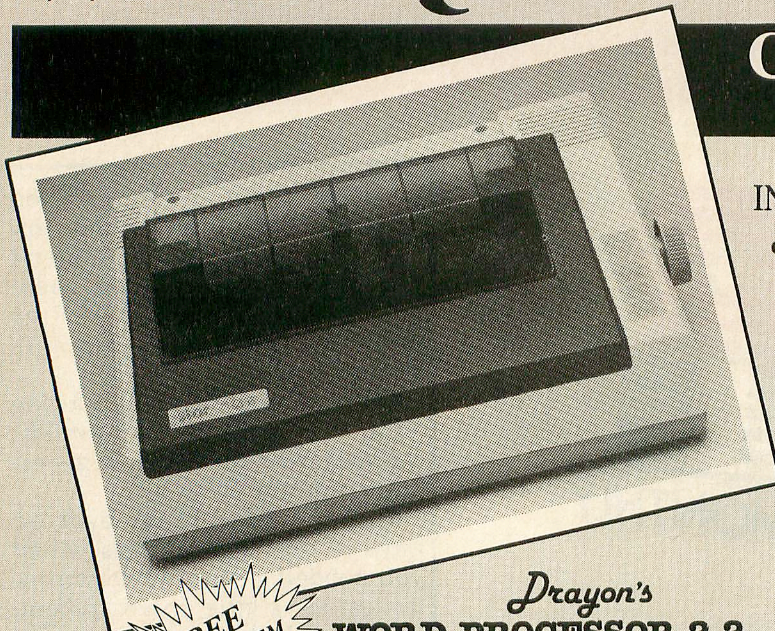

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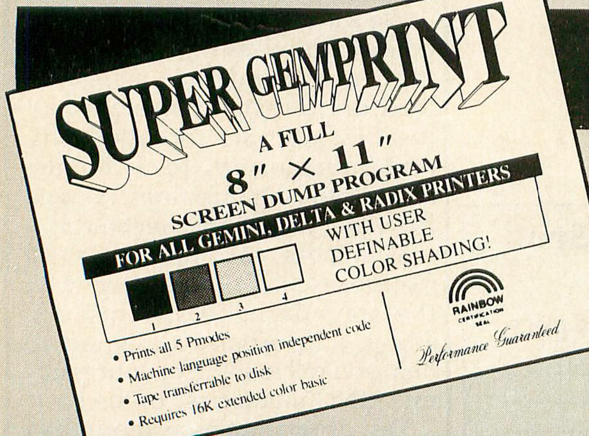

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CCZAP
Helps Find Hidden Control Codes/*Matrix Computing* 185
CoCo Calendar
Can Help You Get Organized/*Spectrum Projects, Inc.* 209
CoCo Cooler Too
Play It Cool/*REM Industries, Inc.* 188
CoCo Incognito
Packed with Useful Information/*RC Creations* 208
CoCo Keyboard Cover
A Real Undercover Operation/*REM Industries, Inc.* 191
Don Pan
Good for Arcade Beginners/*Tandy Corp.* 199
Geography USA
An Excellent Learning Tool/*Viking, Inc.* 206
Gold Runner
Fast and Furious/*Novasoft* 196
House Doc
An Electronic Doctor on Call/*For Your Health Software* 202
Marble Maze
Presents a Challenge for All Ages/*Diecom Products* 197
Micro Illustrator
Creates Dazzling Graphics/*Tandy Corp.* 203
Omniverse
Venture to New Universes/*Computerware* 184
Orchestra-90/CC
Impressive Music Production/*Software Affair* 189
Puzzler
Educational Fun for Adults and Children/*Color Connection Software* ... 190
SDOS
Powerful Package Perfect for Hackers/*Software Dynamics* 200
Stylo-Pak
A New Standard for Word Processing/*Stylo Software* 192
Super Directory Catalog
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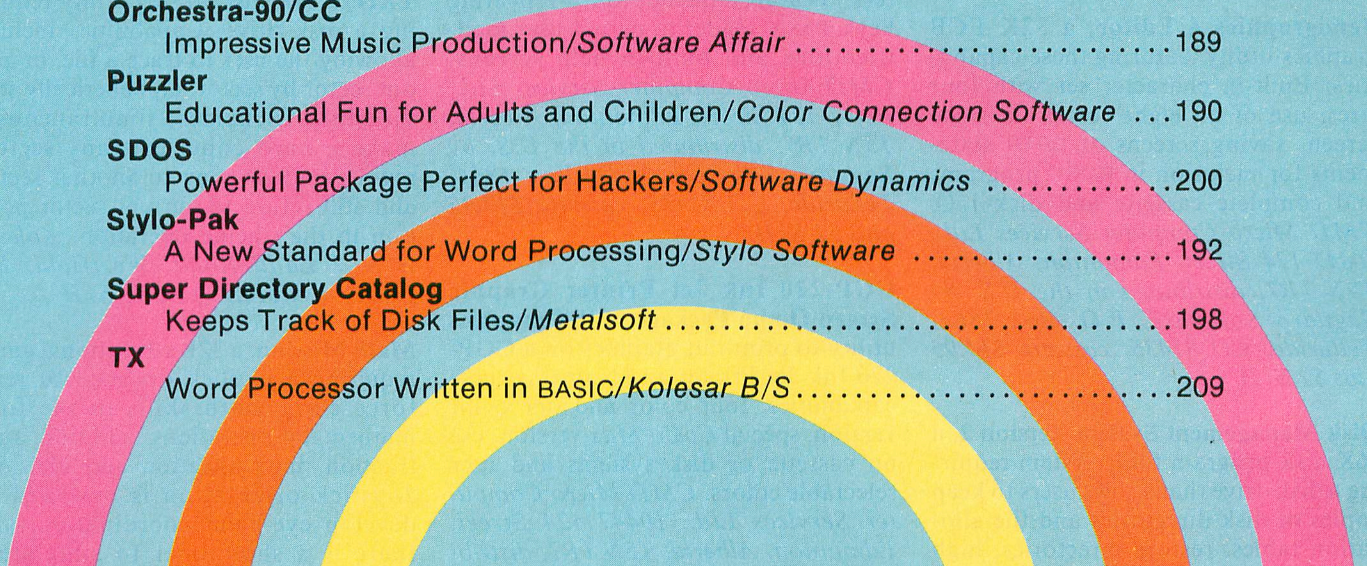
Word Processor Written in BASIC/*Kolesar B/S* 209



RECEIVED & CERTIFIED

The following products recently have been received by THE RAINBOW, examined by our magazine staff and approved for the *Rainbow Seal of Certification*, your assurance that we have seen the product and have ascertained that it is what it purports to be.

This month the *Seal of Certification* has been issued to:

Hall of the King, a 64K graphics Adventure requiring a disk drive. The scenario places you as a seasoned Adventurer on a quest for the legendary Earthstone, a powerful cornerstone of a dwarven race's magical prowess. This two-disk Adventure allows players to save or load a game at any stage of the Adventure. *Prickly-Pear Software, 2640 N. Conestoga Avenue, Tucson, AZ 85749, disks $39.95 plus $1.50 S/H*

Semigraphics 4 Editor, a 32K ECB graphics utility featuring these capabilities: Built-in character set with four sizes, use of all eight colors on same screen, saving screens at DATA statements for inclusion in BASIC programs and complete cassette and disk I/O. *CMD Micro Computer Services Ltd., 10447 124 Street, Edmonton, Alberta, T5N 1R7, distributed in the U.S. by Saguaro Software, P.O. Box 1864, Telluride, CO 81435, cassette $14.95 plus $2 S/H*

Disk Management System Version 2, a 16K disk program filing system requiring a disk drive that allows users to keep copies of disk directories and file allocation tables, restore directories, high speed search for programs, machine language sort and print (32K only) and user adjustable defaults. *CMD Micro Computer Services Ltd., 10447 124 Street, Edmonton, Alberta, T5N 1R7, distributed in the U.S. by Saguaro Software, P.O. Box 1864, Telluride, CO 81435, disk $19.95 plus $2 S/H*

Line Editor, a 16K programming utility for assembly and PASCAL source code that uses Hi-Res 51 by 24 column screen with true upper- and lowercase characters. Features include auto-repeating keys, BASIC loader to permit user modifications and built-in help screens. *CMD Micro Computer Services Ltd., 10447 124 Street, Edmonton, Alberta, T5N 1R7, distributed in the U.S. by Saguaro Software, P.O. Box 1864, Telluride, CO 81435, cassette $17.95 plus $2 S/H*

CGP-220 Ink Jet Printer Graphic Screen Dump Package, a 16K graphics utility to print out graphics on a CGP-220 Ink Jet Printer and featuring these capabilities, four color and one color version, special *CoCo Max* version, use on cassette or disk systems and user selectable colors. *CMD Micro Computer Services Ltd., 10447 124 Street, Edmonton, Alberta, T5N 1R7, distributed in the U.S. by Saguaro Software, P.O. Box 1864, Telluride, CO 81435, cassette $14.95 plus $2 S/H*

NumberJack, a numeric keypad hardware accessory to facilitate number-intensive applications. Measuring 5½ by 7½ by 2½ inches, the keypad can be installed without soldering or drilling. Comes with complete instructions and 3-foot plug-in cable with all necessary connectors. Included on the keypad are four cursor keys, CLEAR, @, decimal point, comma, ENTER and the standard four math keys. *HJL Products, Div. of Touchstone Technology Inc., 955 Buffalo Road, P.O. Box 24954, Rochester, NY 14624, $89.95*

D.L. LOGO, a 64K programming and educational utility requiring a disk drive that will run on OS-9 and designed to utilize one or two joysticks, the Multi-Pak Interface, an X-Pad and the Speech/Sound cartridge to allow users to weave shapes, colors, speech, music and sound into infinite patterns. Also available are mathematical, trigonometric and Boolean functions to allow exploration as users create graphics, learn arithmetic and spelling, play games and strengthen programming skills. *Tandy Corp., available in Radio Shack stores nationwide, manual and disk $99.95*

TXD, a 64K disk editing utility requiring a disk drive. Capabilities include allowing the user to trace a file, map it out sector by sector, alphabetically sort directory filenames, simultaneously make a hard copy, edit any sector, rewrite and/or copy to another sector and still return to current sector position in the tracing operation. *Kolesar B/S, 7 Ladd Road, Westfield, PA 16950, disk $14.95 plus $2 S/H*

Math Mission, a 32K educational game requiring a joystick designed to reinforce early math skills in the four mathematic operations: addition, subtraction, multiplication and division. Joystick orientation is designed to develop eye-hand coordination, and there is a shot timer to simulate a classroom time test as well as four optional levels of difficulty. There are graphics, sound and written rewards for the players. *Sugar Software, 1710 North 50th Avenue, Hollywood, FL 33021, cassette or disk $24.95 plus $1.50 S/H*

Advanced Utilities, a 64K OS-9 package to provide OS-9 users these tools: KSHELL, that allows wild cards with any utility, standard output and error paths can be overwritten or appended to from the command line, selectable prompt of the user's choice; PATH comand allows the setup of multiple path directories to be searched when a command is given; UNLOAD, a repetitive unlink utility to remove modules; FLINK, allowing users to have many different boot files on a given disk and set which one to boot with next time; ARCHIVE, backs up large disk media onto small disk media by filling one disk prompting for a new disk and continuing until all files are offloaded; CPY, performs like the standard COPY plus copies multiple files to a given directory. *Computerware, Box 668, Encinitas, CA 92024, disk $29.95 plus $2 S/H*

CoCo Keyboard Software, a 16/32/64K ECB utility requiring a disk drive that allows users of the HJL-57, Micronix or Deluxe CoCo keyboards easy access to four of the most used functions. The function keys on the HJL-57 and Micronix keyboards or the two function keys and the ALT and CTRL keys of the Deluxe CoCo keyboards can be programmed to perform the following: Text Screen Dump, 9600 Baud printer rate, BASIC `LIST` or cold start of the computer. *Spectrum Projects, Inc., P.O. Box 21272, 93-15 86th Drive, Woodhaven, NY 11421, disk $14.95 plus $3 S/H*

CoCo Calendar, a 32K disk program that aids users in keeping track of daily schedules, appointments, birthdays, etc. Capable of handling any date from the present to December 31, 2000, this program includes a Hi-Res calendar display with the dates containing memos marked. Features include entry, deletion, retrieval by date and dumping to a printer (with user-provided screen dump program) the calendar display. *Spectrum Projects, Inc., P.O. Box 21272, 93-15 86th Drive, Woodhaven, NY 11421, $24.95 plus $3 S/H*

BMC Pan-tilt Monitor Stand, a computer accessory that adjusts a 12-inch monitor for glare-free viewing and capable of revolving 360 degrees and tilting 12.5 degrees. No assembly is necessary. *Spectrum Projects, Inc., P.O. Box 21272, 93-15 86th Drive, Woodhaven, NY 11421, $24.95 plus $3 S/H*

LISTAID, a 4K machine language program designed to format BASIC listing to the text screen or printer. *Neat-O Software, Rt. #3 Box 205, Kingsport, TN 37664, cassette $10 plus $2 S/H*

SCRDMP10, a 16K ECB screen dump program requiring a dot-matrix impact printer and designed to reproduce sideways a `PMODE 3` or `PMODE 4` screen dumped to a printer to give a picture that is 6½ by 7 inches. *Neat-O Software, Rt. #3 Box 205, Kingsport, TN 37664, cassette $10 plus $2 S/H*

OS-9 Enhancements, an addendum introducing the changes and new features of OS-9, Version 02.00.00. Included in the list of new commands and utilities are: CONFIG, to provide a menu of all I/O options and allow selection of any legal combination of device drivers; HELP, to display the syntax and usage of standard OS-9 system commands; INIZ, to force the allocation of device buffers and when used at startup, to keep buffers from fragmenting memory; other system changes to provide capabilities such as networking, 32 and 80 column screen display and access to a Speech/Sound cartridge. Also, updated GETSTAT, SETSTAT and VIRQ system calls. *Tandy Corp., available in Radio Shack stores nationwide, manual and disk $69.95*

Biosphere, a 64K Simulation requiring a disk drive. The scenario places you in the role of master ecologist and captain of the fabulous starship, Arkworld. Arkworld contains within its cargo hold over 200 varieties and species of plants and animals. When you rescue a dying world's colony of native animals it is your goal to use Arkworld's resources to create a new environment in which the colony can survive and flourish. *Tandy Corp., available in Radio Shack stores nationwide, disk $29.95*

CoCo EPROM Programmer, an EPROM programmer with these capabilities: will program EPROMS from 2716 to 27128 and 27512; will program the 24-pin 68764 and 68766 EPROMS that fit in the CoCo ROM sockets, features EPROM Erase?, Verify EPROM, Move EPROM to memory, Examine/Change memory and Change buffer address. *Spectrum Projects, Inc., P.O. Box 21271, 93-15 86th Drive, Woodhaven, NY 11421, $149.95 plus $3 S/H*

Health Programs, a 32K home utility that contains these nutritional instruction features: a list of over 180 foods and analyses to display how much protein, calories, which of 11 vitamins and nine minerals are contained in the food selected, 14 RDA and MDA categories and adjustments for the needs of pregnant and lactating women; deficiency symptoms and food sources for 21 nutrients, recommendations for nutritional therapy for common ailments and a `PMODE 4` graph for biorythms. *Health Software, 1521 Lancelot, Borger TX 79007, cassette or disk $15*

The *Seal of Certification* program is open to all manufacturers of products for the Tandy Color Computer, regardless of whether they advertise in THE RAINBOW.

By awarding a *Seal*, the magazine certifies the product does *exist* — that we have examined it and have a sample copy — but this *does not* constitute any guarantee of satisfaction. As soon as possible, these hardware or software items will be forwarded to THE RAINBOW's reviewers for evaluation.

— Monica Dorth

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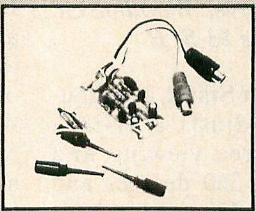

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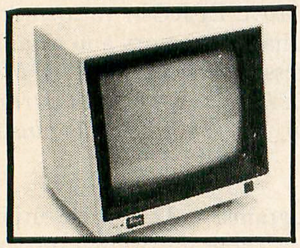

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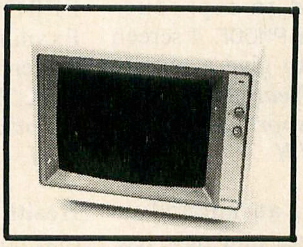

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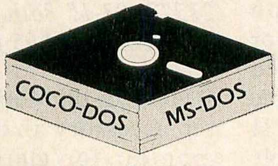

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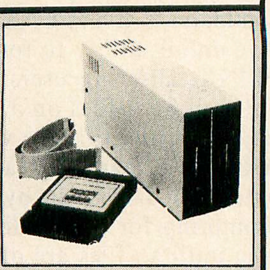

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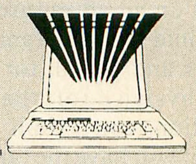

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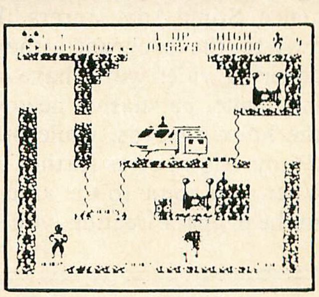

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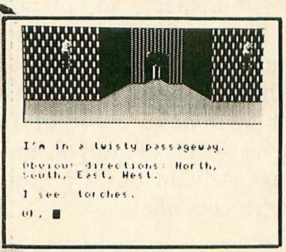

```
I'm in a twisty passageway.
Obvious directions: North,
South, East, West.
I see torches.
??, █
```

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Venture to New Universes and Save Earth in *Omniverse*

In this new 64K graphics Adventure by Scott Cabit for Computerware, you, mild-mannered theoretical physicist, have discovered gateways into new dimensions and universes. Unfortunately, you've also learned of an alien plot to set up networks of these gateways and, through them, conquer Earth. You can save Earth by leaving your equations, computer and synchrotrons behind and sallying forth on an adventure to discover these gateways.

While the program loads into the computer, gather up paper and pencil, for you are about to exchange your life as physicist for that of Adventurer/cartographer. In addition, you'll want a labeled, formatted disk (or a blank tape if you have the tape version) on hand for the saves you'll want to make at strategic intervals.

The Adventure begins on a snowy plain. You first stand watching the snow fall before journeying onward. In this Adventure you can use a joystick or the arrow keys for the compass directions (shifted up- and down-arrow keys for moving up and down). When you wish to examine something, use the standard two-word, verb-noun command sentence. Some Adventurers like to know which words are known to the program, others think part of the fun is discovering which words have meaning. In *Omniverse*, folks of the former persuasion need only type `VOCAB` to see most of the known words, while others can avoid this. Typing `HELP` sometimes gives further assistance.

When you come to the area of a gateway and approach from the proper direction, you suddenly hear music; the sky turns red and the words "You feel very strange" signal that you are being transported to another universe, first from the ice to a desert. There is no turning back! When you happen upon Sam's Saloon, you will want to pause long enough to watch as Sam wipes the bar — one of the cutest graphics in Adventuredom!

Two-Liner Contest Winner . . .

Guitar Capo asks you for a capo number and responds with all the chord and note changes.

The listing:

```
10 DIMN$(12),N1$(12),N2$(12):FOR
T=0TO11:READN$(T):N1$(T)=LEFT$(N
$(T),2):N2$(T)=RIGHT$(N$(T),2):N
EXT:DATA C B#,C#D-,D  ,D#E-,E F-
,F E#,F#G-,G   ,G#A-,A  ,A#B-,B
C-
15 INPUTA:CLS:PRINT@0,"";:INPUT"
CHORDS/NOTES ON CAPO NO.";C:PRIN
T"FRETTED","SOUNDED":IF C>11 THE
N 15:ELSE FOR T=0 TO 11:PRINTN1$
(T)":"N2$(T),:IF C+T>11 THEN C=C
-11:D=T+C:PRINTN1$(D)":"N2$(D):N
EXTT:GOTO15 ELSE PRINT N1$(T+C)+
":"+N2$(T+C):NEXT T:GOTO15
```

Donny Schiavone
Tulsa, OK

(For this winning two-liner contest entry, the author has been sent copies of both *The Second Rainbow Book Of Adventures* and its companion *The Second Rainbow Adventures Tape.*)

Once you find the gateway out of the desert, you are transported to a jungle, from there to a desert island and, after a few surprises, find yourself on a barren, rocky volcanic island, and hopefully will be able to solve the Adventure and thus save Earth. When you do, you are treated to a scrolling Mercator projection of Earth and the song "Happy Trails."

The game is loaded by typing `LOADM "OMNI"`; the disk starts whirring and OK appears on the screen — then panic sets in — the disk keeps whirring madly and there is no cursor after the OK prompt. At this point the temptation is great to push the Reset button, thinking the program has fouled up. Resist that impulse! The program itself is loading — and it takes over one minute. Eventually, the drive stops spinning and the usual color check appears on the screen. Since the loading of *Omniverse* is different from usual, I think Computerware should mention it in the loading directions.

The save game feature used is also new to me, and a few words of caution are in order here. I mentioned that your progress can be saved before each peril, real or imagined; you number each one from zero to nine, but individual saves do not show up in the directory when the `DIR` command is used, and `FREE` returns 68, even if there are 10 saves on the disk. Disk inspection reveals that *Omniverse* writes directly to Track 0. If, in haste, you grab the first formatted, blank disk in your disk box and forget to label it, you could mistake this for another blank disk at some future date. If you do not record on your map the number of the individual save, as well as where it occurs, a save you wish to keep can easily be overwritten.

There are a number of features included in *Omniverse* that are not found in the average Adventure. In addition to being able to use the joystick or arrow keys for movement, those with the Radio Shack speech module can elect to have all writing, which appears on the screen, spoken through their speech cartridge. If you tire of this feature, it can be toggled off. Scott Cabit also includes multipart music in the program, and thoughtfully allowed for those of us in a hurry to get on with the action to abbreviate it by depressing the space bar. However, the music is so well-done that you will want to take the time to listen to it at least once.

Omniverse has over 200 locations in several separate "worlds" to inspect, so, of course, many use the same pictures. Some of these are outstanding and, overall, the pictures are clear and colorful. There are fewer objects to inspect than in many Adventures and few real puzzles. Everyone will have a lot of fun wandering about and enjoying its special features, but it is not too difficult for the average Adventurer. Careful map-making is the key to success with this one.

(Computerware, P.O. Box 668, Encinitas, CA 92024, requires 64K, tape $24.95, disk $27.95 plus $2 S/H)

— Carol Kueppers

CCZAP Helps Find Hidden Control Codes

About two days after I got my disk drive, I discovered what a disk zap program is for. I'm sure no one else has ever accidentally gotten a write-protect tab stuck in his disk drive, but believe it or not, I did. You would be amazed how poorly a disk drive writes with a protect tab floating around in it! I found out the hard way. Luckily, I had a friend with a zap program. He helped me out of my problem.

CCZAP is a disk zap utility program. A disk zap is a program that reads the contents of a disk directly and without regard to the nature of the data. Generally the user is given a choice of format for the presentation of the data, i.e., ASCII, hexadecimal or some combination of the two.

I received *CCZAP* on a disk along with four pages of documentation that covered the bare bones operation of the program. One of the surprising things in the documentation is all the possible drive variations for which the authors have allowed. The program allows you to have up to four drives, up to 80 tracks per drive and up to 36 sectors per track. This nice feature allows those with JDOS and double-sided drives to use *CCZAP*.

To make the program start, the user inserts the disk with *CCZAP* in Drive 0 and types `RUN "RUNCCZAP"`. This is *not* a misprint; the program name is *RUNCCZAP*. The program loads a binary file that is patched with the answers the user supplies about track numbers, sector counts, etc. The program then allows you to save this setup for future use. From this point on, the program is completely menu driven.

The main menu gives several options:

R — read a user specified track and sector
M — modify the selected track and sector
W — write the modified selection
SHFT CLR — print the selection
B — exit to BASIC
; — advance to the next sector
- — back up to the previous sector

The first action the user must take in using the zap program is to read the desired track and sector. Both the track and sector must be entered in hexadecimal.

Entering 'M' at the main menu allows you to modify or examine the contents of your selected track and sector. This display is in ASCII format with all nonprintable characters as periods. When examining sector contents, it is sometimes useful to see all the contents including the otherwise hidden control codes. This is accomplished by pressing the CLEAR key. Pressing the BREAK key takes you back to the main menu. Changing the contents of the sector is done by using the arrow keys to position the cursor over the desired character and simply typing over it. If the display is in ASCII you must use ASCII, if not, you must use hexadecimal notation. After changing the sector, you must use the 'W' selection to write the desired changes to disk.

At the main menu the user may advance one sector at a time by pressing the ';' key or back up one sector by pressing the '-' key. This action must be followed by the 'R' selection to read the new sector.

All of the program selections ran well and I was not able to break out of the program, nor was I able to make the program crash.

While I cannot honestly fault the *CCZAP* in any particular section, I did not feel comfortable using it. This is the first program I have used in which I felt trapped by the menu-driven structure. For example, if you are looking for a particular piece of data in a file and incorrectly guess its location, you must go back to the menu, make another guess, read the data and examine the data. This is not particularly user friendly. Forcing the user to enter track and sector in hexadecimal and allowing the user to view the contents either in Hex or ASCII, but not both at the same time, is also not very user friendly.

I would like to suggest to the authors that rather than a menu screen, the display could be the sector itself. The menu could be above and below in a scroll-protected area. This would allow the user to see the contents and not have to return to the menu to select another sector. If the authors divided the screen into two halves, left and right, the Hex notation and the ASCII could be viewed at the same time; it would make the user's job much simpler. As a user, I would gladly exchange the ability to see an entire sector for the simplicity gained.

CCZAP is basically a good program that could be made a lot better by making it easier to use. The price seems to be a little high in light of the current trend to keep software prices low and sell more copies, however, I do not hesitate to recommend this program.

(Matrix Computing, P.O. Box 2011, 380 5th Avenue, SE, Salmon Arm, British Columbia, Canada V0E 2T0, printer optional, disk $49.95 U.S. funds)

— Larry Goldwasser

One-Liner Contest Winner . . .

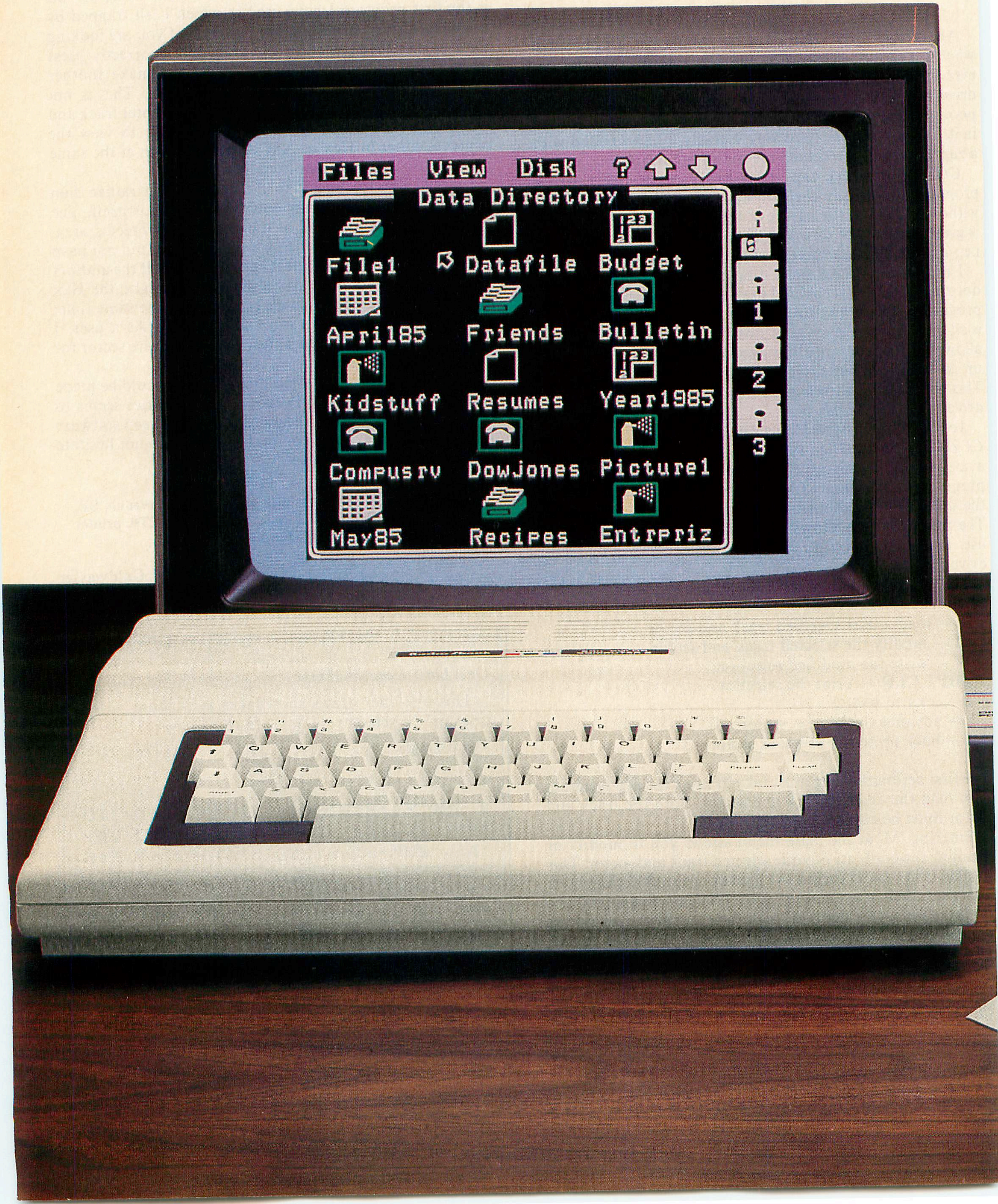
This one-liner draws snowflakes at random positions on the screen

The listing:

```
0 PMODE4:SCREEN1,1:PCLS:FORD=1TO
20:A=RND(20):B=RND(20):C=RND(20)
:A$="BM"+STR$(RND(216)+20)+","+S
TR$(RND(151)+20)+";A"+STR$(RND(4
)-1)+";ND=A;NU=A;NL=B;NR=B;NE=C;
NG=C;NH=C;NF=C;":DRAWA$:NEXT:FOR
Z=1TO2300:NEXT:GOTO
```

Garry Sittler
Jacksonville, IL

(For this winning one-liner contest entries, the author has been sent copies of both *The Second Rainbow Book Of Adventures* and its companion *The Second Rainbow Adventures Tape.*)



Files
View
Disk
?
Data Directory
File1
Datafile
Budget
April85
Friends
Bulletin
Kidstuff
Resumes
Year1985
Compusrv
DowJones
Picture1
May85
Recipes
Entrpriz
1
2
3

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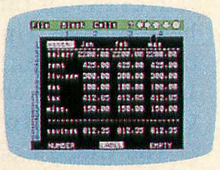
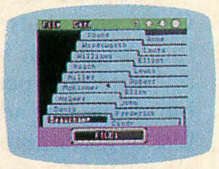
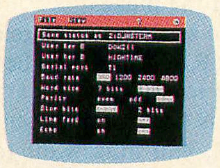
A simple spreadsheet program includes an easy-to-use menu and automatic column formatting. You can use *LEDGER* to do budgeting, sales forecasting, profit-and-loss projections and other "What f . . .?" calculations.


LEDGER

A four-color picture editor lets you create lines, shapes, patterns, fills in areas with color and enter text. Using *PAINT,* you can create colorful charts, graphs, designs and "doodles" on your screen, then print a copy on a dot-matrix or ink-jet printer.

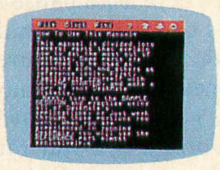

INDEX CARDS

The *INDEX CARDS* personal filing system lets you enter and edit data and perform simple sorts and searches. It's ideal for keeping track of names and addresses.

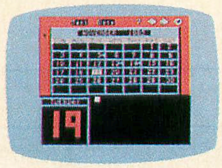

TELECOM

TELECOM, a communications program lets you access national information services, plus transmit and receive files from other computers by phone (requires modem).

A simple monthly calendar program displays "to do's" for any date. *CALENDAR* is an easy way to organize your work day.


TEXT EDITOR

A four-function *CALCULATOR,* with memory, is also available within any application without interrupting the screen in the program you are currently using.


CALENDAR

If you don't already have a disk drive for your color computer, you can add one for just $299 (26-3131). The $5^1/_4$", thinline floppy drive plugs into your Program Pak® port for over 156,000 characters of storage. Add a second drive at any time, too.

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Watch out for the Deadly Bite in *Buzzworm*

You are "Buzzworm," a very hungry snake. Your job (like it or not) is to run around a maze full of snake bait. When you run over each piece of bait, your tail instantly increases in length about one-half inch (talk about eating your vegetables). The purpose of the game is not to bite yourself while going around the maze.

Buzzworm is one of the earliest releases from Novasoft. It requires 32K of RAM and can be played either on the keyboard or with a joystick.

The game itself is very simple, but with all of the bells and whistles it has, you may want to take a closer look. Some of the features are as follows: Every fifth screen is a surprise bonus round, where bait is worth 100 points, and you may not die. Another feature is that when a 10,000 point plateau is reached, an egg is dropped on the screen. You must try not to eat the egg, even though it is worth 1,000 points, because inside the egg is an extra buzzworm.

At the conclusion of a game you may choose to play again or to end the game. There is no pause in *Buzzworm* because of the speed. This is one feature I think should be added.

I did not think *Buzzworm* measured up to many of the other Novasoft games. It does not have the exciting pizazz like all of the other games from Novasoft that I have seen lately. I give *Buzzworm* a two-star rating, which is slightly below average. I recommend that you look at it before buying it.

(Novasoft, 4285 Bradford N.E., Grand Rapids, MI 49506, tape $15.95, disk $18.95)

— Patrick Downard

Hint . . .

Disk Directory Printout

If you have a long disk directory and want to see all of it, or if you simply wish to have a hard copy printout of your directory, one simple command allows you to do this easily.

Just `POKE 111,254:DIR` and the entire disk directory will appear on your printer, even if it is too long to be fully displayed on the screen.

Play it Cool with CoCo Cooler Too

Heat! It is a problem known to many CoCo owners. Excessive heat can make a CoCo suddenly lock up or go off to never-never land, taking your data and several hours of work with it. CoCo I owners who have had heat problems have been using a product called the CoCo Cooler, a fan that draws air through the computer to reduce or eliminate heat buildup. Up until now, CoCo 2 owners have been out of luck. But wait! Just when you thought all was lost, REM Industries has come out with the "Son of CoCo Cooler": CoCo Cooler Too.

The CoCo Cooler Too is a fan designed to attach (with adhesive foam) to the left rear of your CoCo 2. To install it, all you do is peel the protective strip off the foam and position the fan properly over the vent holes on the top rear left corner of the case. Once installed, it should never come off as the adhesive bonds it securely. After installation, just plug the fan into the wall and turn the power on; the CoCo Cooler Too starts working.

CoCo Cooler Too draws air through the inside of your CoCo and sends it out into the room, taking the heat inside the CoCo with it. I found the CoCo Cooler Too reduced the inside temperature of my CoCo by about five degrees, but it must be added that my computer runs at only about five degrees hotter than air temperature. REM Industries claims the Cooler will bring the inside temperature of your CoCo to "within 15 degrees of ambient in worst case situations."

I found that using the Cooler caused no inconvenience with using my CoCo. The fan makes very little noise — certainly no more than the built-in fans on the PC-type computers. The fan points down toward the table, so there is very little air current to blow things around on your desk.

If you have a need to reduce heat buildup in your CoCo 2, the CoCo Cooler Too is a good solution, although the price makes this an "as needed" item. Dr. Megabyte says if you are not having an excessive heat problem, then you most likely don't need this product. It is, however, cheap when compared to the cost of down time and repair bills caused by overheating your CoCo.

(REM Industries, Inc., 9420-B Lurline Ave., Chatsworth, CA 91311, $44.95)

— Mark E. Sunderlin

ENHANCE YOUR COCO!

The Enhancer gives you mixed text and graphics, user-defined keys, PROCEDURES, keyboard AUTO-REPEAT, scroll protect. It gives you true lower-case letters, 224 characters, user-definable characters, reverse/bold/underlined characters. The Enhancer adds 15 commands and 3 functions to your CoCo's vocabulary. It requires 64K, Extended BASIC. To order, please specify tape or disk and send $18.00 U.S. to:

H.D.R. Software
27 Doyle Street
St. John's, Nfld.
Canada A1E 2N9 Tel. (709) 364-3125

Hardware Review

Orchestra-90/CC Impresses with its Music Production

At the tender age of 5, Beethoven was composing. At 16, Mozart was a recognized master. If you've ever felt the urge to create your own beautiful music, or even to borrow someone else's for your own ends, then you should look into the comprehensive stereo music synthesizer, Orchestra-90/CC, from Tandy. Included in the package is a ROM pack with stereo outlets and a 100-page manual to get you started. The minimum system required is a 16K CoCo and either a stereo (for stereo sound) or television (for monaural sound). The system can be used with tape or disk (though a Multi-Pak is necessary for disk) to save and load compositions, a printer to print your music files, or a modem to transfer and receive files.

Right away you will be impressed with the documentation. I am an amateur musician (guitar and trombone), but no great musical knowledge is necessary to begin programming music right away. The music language used in Orchestra-90/CC makes it possible to transcribe or compose music line by line in any time or key signature using whole to 64th notes. You can use six octave ranges and up to five simultaneous voices using two stereo channels. Each of the voices may be assigned any of five instrumental choices (tone colors to sound like a trumpet, an oboe, a clarinet, an organ or a violin). You can single, double or triple-dot the notes, and three articulations are possible. You can even modulate (change to a different key) within the song.

A new feature I discovered while doing this review is the ability to now use the speed-up poke with Orchestra-90/CC. This allows the processor within the hardware to make a more accurate sampling, which allows for higher and cleaner notes and better sound quality overall.

When first hooking up your system, a demonstration music file of Rossini's "William Tell Overture" shows off just what Orchestra-90/CC can do. Heard over the television, this composition is quite impressive, but played over the stereo the quality is terrific. With that as cajoling, you are ready to begin programming on your own.

The manual takes you through some samples, beginning with simple tunes, then walks you through transcribing a piece of music from the score. And speaking of score, the system requires a one-letter command to score the music you've programmed in before playing the piece. This processes your program, but more importantly, it checks for any mistakes and highlights them so you can go back and easily make corrections before the performance.

I asked my wife, who teaches junior high music at a public school, to look over Orchestra-90/CC. She was impressed with the logic of the music language. She felt it could go a long way toward teaching music theory, but on an individual basis rather than in a classroom situation.

Make no mistake about it, this is a powerful music synthesizer. It has the capability of producing beautiful music, but only as you master the music language. There are no frills with this package — no graphics, no flashing colors, no actual music printouts — which may be where Orchestra-90/CC is lacking the most. You need to take this system seriously for it to be any fun at all. Music can express the depths of our souls, and it may take a while to grasp the music language, but once you do, you'll be able to produce intricate and beautiful music.

(Software Affair, distributed by Tandy Corp., available at Radio Shack stores nationwide, $79.95)

— Jefferson L. Hatch

Hint . . .

What's Your ROM Version?

With all the talk about new ROMs, you may be wondering exactly which ROM you have. If you have an older CoCo with Extended BASIC, just read the version number of your Extended BASIC at the top of the screen on power up. Then, to see which Color BASIC ROM you have, type `EXEC 41175` and press ENTER.

If you have the new ROMs, Extended BASIC will be Version 1.1 and Color BASIC will be Version 1.2.

On the CoCo 2, Color BASIC will always be Version 1.2 or 1.3 (which are functionally identical).

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Fun *Puzzler* is Educational for Adults and Children Alike

By Carol Kueppers

Puzzler is a machine language program that generates three popular paper-and-pencil puzzles — word search, crossword and scrambled word, from lists of words and their definitions which you create using the mini-editor provided in the program. It comes as a complete package and includes a nine-page instruction booklet that is a pleasure to use because it details clearly, with a touch of humor, how to use the program. The disk (or tape) also includes three sample lists so you can go through the procedures effortlessly, familiarizing yourself with the program functions before moving on to your own puzzle-making activities.

Many of you may already have a puzzle generator in BASIC from RAINBOW's December 1982 issue. In the past three years I have prepared puzzles for everything from personalized birthday cards to vocabulary hand-outs for the classes I visit with an "Art Goes to School" presentation. These puzzles have been enormously successful, and, in the case of the school classes, provide reinforcement of the subject matter, but they are somewhat limited.

Puzzler's word search puzzle generator creates a puzzle in seconds, in the dimensions you choose. In addition, it allows new choices for the finished product. Young children have trouble finding words on the diagonal, so with *Puzzler* they can be eliminated; you can make puzzles for young readers using their vocabulary — and they can make puzzles for you from the same word list, but including the diagonals. You can race to the finish!

Despite their popularity, these standard word search puzzles are a bit primitive, presenting only a matrix of letters with a neat list of the requested words beneath. However, *Puzzler* gives you the ability to print definitions instead of words. Since you compose the definitions, they can be as easy or as difficult as you dare! Now the solver has to think up the possible correct word and search for that. Obviously, this makes a better hand-out for classrooms since the definitions are a summary of the material, but any puzzle lover will appreciate the variety.

When making crossword puzzles, you'll find the puzzles resemble a completed "Scrabble" game, or those found in word game books for children. The puzzles interlock at few points, so there are few common letters to act as clues in the solution. They look easier than they actually are, which is something to remember when writing the definitions. The puzzle generator, nonetheless, creates puzzles that are a great deal of fun to solve.

You may create lists of words and definitions at any time, then save them and use them for the puzzles. When you select "compile crossword" from the menu of choices, the screen shows which try the program is working on and flashes some symbols across the screen as it works. I liked this feature a lot, since all too often programs present only a blank screen while computations occur and I'm never sure if the program is working, or (perish the thought!), has vanished into never-never land.

The generator may not succeed in placing all of the words in the puzzle in its first five tries. You then have the option of viewing the puzzle, asking it to meet or beat its best attempt, accepting the placement as is or entering the "endless retry" mode. In endless retry, a list of 30 words is placed in only a couple of minutes. For the purposes of this review I filled the program's buffer with a list of 50 words and their definitions, selected endless retry and left for the evening. After four hours it had not succeeded, but showed

Two-Liner Contest Winner . . .

This two-line program sorts the filenames on a disk into alphabetical order. Back up the diskette first, then insert it into Drive 0 and RUN.

The listing:

```
0 CLEAR4000:DIMF$(72):H=0:FORS=3
TO11:DSKI$0,17,S,A$,B$:C$=A$+LEF
T$(B$,127):K=1:L=H+1:H=H+8:FORN=
L TOH:IFMID$(C$,K,1)<>CHR$(255)T
HENF$(N)=MID$(C$,K,31):K=K+32:NE
XTN:NEXTS:ELSEFORI=1TON-2:FORJ=I
 TON-1:IFF$(J)<F$(I)THENT$=F$(J)
:F$(J)=F$(I):F$(I)=T$
1 NEXTJ:NEXTI:FORI=N TO72:F$(I)=
STRING$(31,255):NEXTI:T$=CHR$(0)
:I=1:FORS=3TO11:A$=F$(I)+T$+F$(I
+1)+T$+F$(I+2)+T$+F$(I+3)+T$:B$=
F$(I+4)+T$+F$(I+5)+T$+F$(I+6)+T$
+F$(I+7)+T$:DSKO$0,17,S,A$,B$:I=
I+8:NEXTS:CLEAR200:END
```

Stephen Hunter
Athens, GA

(For this winning two-liner contest entry, the author has been sent copies of both *The Second Rainbow Book Of Adventures* and its companion *The Second Rainbow Adventures Tape.*)

Two-Liner Contest Winner . . .

Rock-Scissors-Paper is a two-line CoCo version of the old favorite.

The listing:

```
10 EXEC44539:CLS3:C$(2)="ROCK":C
$(3)="SCISSORS":C$(1)="PAPER":A$
="I WIN-":B$="YOU WIN-":D$="SCIS
SORS CUT PAPER":E$="ROCK BREAKS
SCISSORS":F$="PAPER COVERS ROCK"
:G$="TIE":PRINT"CHOOSE rOCK-sCIS
SORS-pAPER ";:EXEC44539:X$=INKEY
$:C=RND(3):IFX$="P"THENX$="Q
20 PRINT:PRINTC$(ASC(X$)-80),C$(
C):H$=X$+STR$(C):IFH$="R 3"THENP
RINTB$;E$:RUNELSEIFH$="S 1"THENP
RINTB$;D$:RUNELSEIFH$="Q 2"THENP
RINTB$;F$:RUNELSEIFH$="R 1"THENP
RINTA$;F$:RUNELSEIFH$="S 2"THENP
RINTA$;E$:RUNELSEIFH$="Q 3"THENP
RINTA$;D$:RUNELSEPRINTG$:RUN
```

Meg and Paul Clough
Houston, TX

(For this winning two-liner contest entry, the author has been sent copies of both *The Second Rainbow Book Of Adventures* and its companion *The Second Rainbow Adventures Tape.*)

that its best placement was 36 words. I then selected the menu option "meet or beat best" attempt. After 10 minutes it had achieved that goal. The instructions do not state the present limit on the program, but it appears to be between 30 and 40 words. It is probably easier, and faster, to edit long lists down to a 30-word total to be sure the finished puzzle includes all the words you consider essential before compiling a puzzle. Real fans can use *Puzzler* to create a framework and add to it manually.

To print out the graphics of the crosswords, the program includes screen dumps for the most popular dot-matrix printers. If your printer is not on the list, you can first try those listed to see if one works. If none do and you have a screen dump program for your printer, you can first print out the definitions, save the graphics screen, exit *Puzzler*, load in the graphics screen and the screen dump program, and proceed. Although the program worked fine with my Radio Shack Line Printer VIII, I tested this option and can report that it does work.

However, you might want to take advantage of Color Connection's third option, which is to contact them for technical advice and customize *Puzzler*'s screen dump program for your printer, or send a photocopy of your printer manual's bit-image graphics pages and they will customize the program for you. I spoke with Color Connection and found them friendly, helpful and anxious to have their customers enjoy their creations.

The third puzzle type, scrambled words, simply takes your word list and scrambles the letters. All three types allow you to print an answer key.

I created a few puzzles for a group of kids one rainy Saturday. They, in turn, thought up puzzles for me — it took them a while since they were trying for the obscure, and they looked through encyclopedia volumes, history books and even *Bartlett's* for a couple of quotes. Their completed masterpiece was absolutely impossible. To their vast amusement, I kept begging for hints and ended up with only four correct answers! All of them, meanwhile, had inadvertently learned quite a bit. I suggest that other families do this the same way; your kids will probably also enjoy stumping the adults.

As good as *Puzzler* is at present, the author, Darren Croft, is working on some improvements that will probably be finished by the time this review appears. The upgrade will permit several previously created lists to be loaded in at once, so words and definitions can be selected from them, rather than requiring each new list to "start from scratch." This effect can be achieved at present by loading the various lists into any word processing program that accepts ASCII files. You then edit carefully, retain the *Puzzler* format, save your new list and use it for puzzle making. The new version will make crosswords that accept more words and will include screen dumps for more printers.

Puzzler is terrific. Adults who love puzzles will have lots of fun with your creations — include a couple personalized ones with your next get-well card. Families, teachers and scout leaders can quickly make up an assortment of puzzles to have on hand for a rainy day or that "endless" car or plane trip, as well as using these as an educational tool.

(Color Connection Software, 1080 Buddlea Drive, Sandy, UT 84070, 32K disk or tape $29.95)

Accessory Review

Stay Undercover with the CoCo Keyboard Cover

This will be a short review — just how much can you say about a keyboard cover? The CoCo Keyboard Cover is made of hard, opaque black plastic with a smooth, shiny finish. It fits the Color Computer keyboard even if you have installed one of several after-market keyboards available for the CoCo. (I have installed a keyboard with keys that stick up a bit higher than other keyboards I've seen, and the cover fits fine.) There is a decal on the inside of the cover that lists some of the most commonly used `PEEK`s and `POKE`s, i.e., printer Baud rate, high-speed, hard copy of directory, start, end, and execute addresses of machine language programs, as well as a chart showing the memory locations of the keys.

This accessory does not take up another outlet on your power strip, and it keeps dust off of the keyboard. The decal is a nice touch, but to read it, you have to remove the cover and find some place to prop it up so you can see it. For something so simple, the price does seem to be a bit much.

(REM Industries, Inc., 9420-B Lurline Ave., Chatsworth, CA 91311, $9.95 plus $2.50 S/H)

— Mark Williams

CORRECTIONS

"Trivia Tic-Tac-Toe" (December 1985, Page 69): Richard Pitel tells us that some readers with cassette systems have reported a problem with the *Tic-Tac-Toe* program.

Line 220 reads `CLOSE 1`. This statement closes the disk file, and on a cassette system you may get a DN Error message. Simply delete Line 220 to take care of this problem. If you add a disk drive to your system, put Line 220 back in.

"Letters to Rainbow" (February 1986, Page 7): The "Editor's Note" in response to a letter from Brian Collins of Waldorf, Maryland ("Computer Animation on a VCR") had the commands at the end of the instructions transposed. It should read: "When you want to record do a `MOTOR OFF`. Do a `MOTOR ON` when you want to stop." We apologize for being so backward!

In our effort to advise you quickly of any revisions, omissions, corrections or enhancements to our program listings, these will be posted on our new Delphi CoCo SIG as soon as they are reported, and will then be printed in the earliest possible issue of THE RAINBOW. From the CoCo SIG> prompt, pick TOPICS, then INFO ON RAINBOW.

Software Review

Stylo-Pak Sets a New Standard for Word Processing

By Dale E. Shell

As a reviewer, I have been lucky enough to have had very few bad products to review. It is usually easy to write a negative review, but when a really outstanding product comes along, it's sometimes difficult to convey how good a product is. I have found one of these products.

Of all the word processors for the Color Computer, I had progressed through five of them before I received *Stylograph*. I was happy with each one before I went to the next one in line, which I thought better fit my needs. I can still see the advantages each one had over the others, but I can now say, without hesitation, that *Stylograph*, when teamed up with PBJ's *Word-Pak*, is by far the best word processor for the Color Computer. I feel qualified to say this since I have actively used five different processors before this one. *Stylograph* is one part of *Stylo-Pak*, from Stylo Software.

You do not have to have an 80-column card to use *Stylograph*; all you need is OS-9. *Stylograph* comes with its own 51-column driver; it also has a driver to support *O-Pak*. I believe the *Word-Pak* best enhances all of its features. It is really nice to see all 80 columns at the same time. This is not like the 85 columns some processors say they have available. Their 85 columns are used in their "window" mode so you can see how things are going to look when printed. You can easily read these 80 columns, and it really looks professional. It helps bring the CoCo up out of the game computer category and into the serious computer systems.

Stylograph has so many features that you will wonder how you ever got along without them on your "old" word processor. Like many other processors, *Stylograph* has a cursor-based editing system that allows you to work on any portion of the text by just moving the cursor to that point. It uses many single keystroke commands, which are symmetrically arranged on the keyboard to quickly move the cursor around the text. The selection of these keys is different from the other processors I have used, so yes, there is some learning required, but it is well worth it.

Cursor control includes up, down, left, right, tabs, margin positions and any page or specified series of letters or words. The display can be scrolled up, down, left or right. This feature is not always used with *Word-Pak* since you can see 80 columns at a time. Any block of text can be moved, copied, duplicated or deleted. *Stylograph* also has a global replace so that some or all occurrences of a given word or string of words can be replaced. It includes a "Keyboard Function" card in the manual. This card can be placed in a convenient location for quick reference until you get used to all the functions available.

Dynamic screen formatting is a strong feature of *Stylograph*. Dynamic screen formatting means the text is immediately formatted on the screen in the same way as it appears on the printed copy. The text display is continuously updated to reflect any changes. This is one of the impressive features that usually only appears on very expensive systems. This is much better than the way some processors use a "window" so you can see how the printed page will look. Some do not even have the window. With *Stylograph*, if you center a section of text, it is immediately centered on the screen; if you right-hand justify, that is reflected on your screen. Any of the text or individual lines may be centered, left justified and/or right justified. You truly have "what you see is what you get." Even margins can be set and changed at any place in the text with simple commands that control the line length, left margin, headers and footers. Of course, wrap-around is used, and the headers and footers are also inserted, so the operator always knows what portion of the page is being worked on.

Stylograph allows modification of characters or words in a variety of ways. It uses reverse video such that each time you "boldface" a word, the screen displays the word in reverse video. This enables identification of any character modifications easily and quickly when scrolling through text.

Another feature I really like is the "page break." When you get to the end of a page while entering text, a dotted line goes across the screen to let you know where each line is relative to the new page. A manual page break is available so you can eliminate orphans and widows. These are single lines of a paragraph that print on a different page than the rest of the paragraph.

Along with boldface, *Stylograph* lets you take advantage of all the features your printer is capable of doing. Some of these include: expanded print, condensed print, 1.5 line spacing, superscript, subscript, underline, overline or any combination. Also, true proportional spacing is supported on the specialty printers. Your printer may not be able to use all the options available, but all your printer's options are probably supported by *Stylograph*. A configuration program is included that allows you to customize *Stylograph* for your printer. *Stylograph* comes configured for the most popular printers, and you can have it default to your printer. If you do not see your printer in its table, it is very easy to add your printer to its list. (I had to do this with my Riteman Plus.) As said before, you can have *Stylograph* default to your printer, but you also have the option when you call up *Stylograph*, to call up any of the 12 possible printer drivers.

I am always concerned with the lack of good documentation that comes with a program. This manual consists of well over 200 pages. While the number of pages is not an indication of how well the program is documented, the pages of this manual are organized and include a lot of information. Most parts of the manual are designed so very little knowledge of computer systems is needed to use it effectively. Some knowledge of the OS-9 operating system

Hint . . .

Slow Scrolling through Orange

Here's a powerful little POKE that slows your scrolling by creating a horizontal `LIST`. Type `POKE 359,60` and you'll see what we mean. Add a colon (:) and `SCREEN0,1` and you'll be slow-scrolling across an orange screen. To return to the green screen at full tilt, just type `POKE 359,126`.

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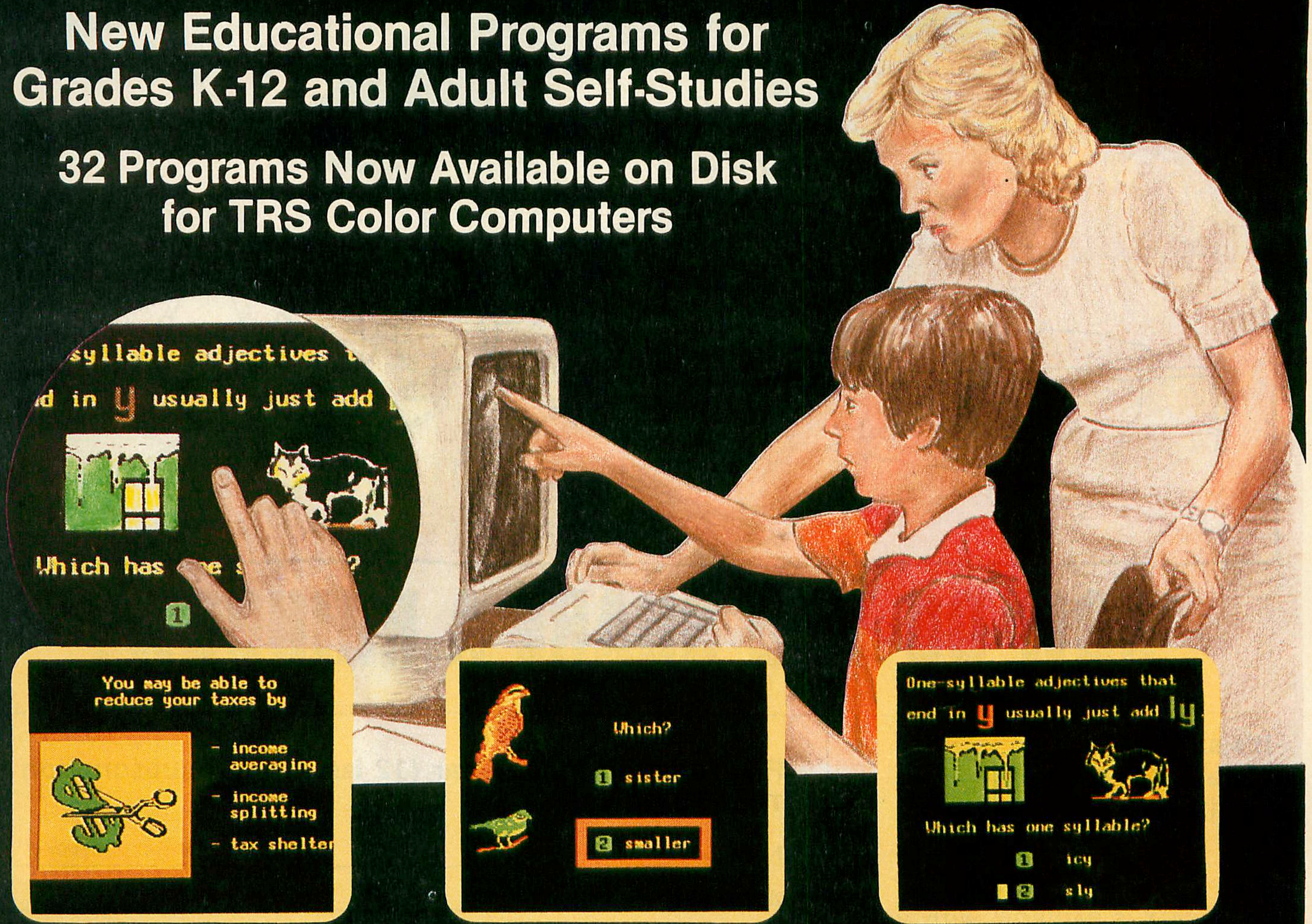
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d in y usually just add
Which has one s ?
1
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- income averaging
- income splitting
- tax shelter
Which?
1 sister
2 smaller
One-syllable adjectives that end in y usually just add ly
Which has one syllable?
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2 sly

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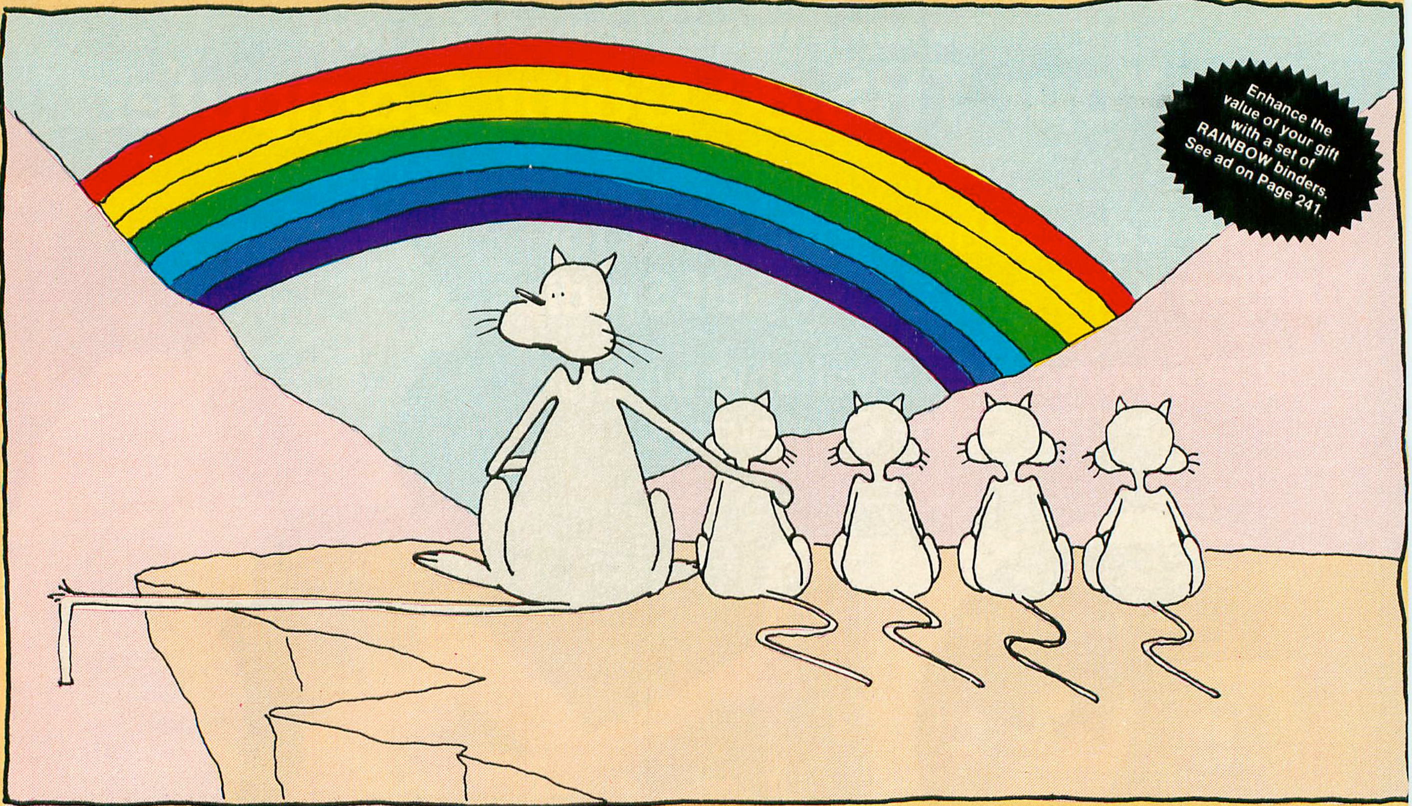

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is helpful to copy the files needed to set up *Stylograph*, but normally it takes a person with reasonable typing skills only a short time to start using the program competently. Once *Stylograph* is installed on a system disk, almost anyone can be using it in no time.

The manual has a three-lesson tutorial, which is broken into four parts; the best way to learn to use *Stylograph* is to sit down with your CoCo and practice all the commands as they are explained in the tutorial. The exercises are designed for the person who is inexperienced with computers and who will be using the word processing program for the first time. A person with even a little OS-9 experience can go through the tutorial in just a few hours, but take your time and review the functions after using them.

The minimum hardware requirements include a 64K CoCo, one disk drive, a TV screen and a printer. While this allows you to run *Stylograph*, you have to do a lot of disk swapping and you are limited to a 51 by 24 screen. The ideal configuration adds another disk drive, a standard screen monitor and an 80-column card — this is what I used. This configuration turns the Color Computer into a viable desktop computer. I am constantly amazed at the CoCo's ability to grow and expand. Just look at the computer systems that came along at the same time the CoCo first appeared — they are not around anymore and the CoCo continues to get better.

Stylo-Pak includes *Stylograph, Mail Merge* and the *Spelling Checker. Mail Merge* lets you conveniently merge variables such as names, addresses and dates at printout time for form letters. It also allows for breaking large files into smaller, more manageable blocks so they can be appended together at printout. Page numbers remain consecutive and headers and footers are automatically retained. The *Spelling Checker* offers a dictionary of up to 42,000 words. Words not found in the main dictionary or the supplementary dictionary may be marked for later editing, skipped, added to the supplementary dictionary or corrected on the spot. This is where my only complaint of *Stylo-Pak* comes in. After a suspected word is found, if you want to correct it, you have to enter the word and make sure it is spelled correctly. Why do you have to get another dictionary to look up a word when you already have one in your computer? I would like to see a "look-up" option that can be accessed at the time the text is being reviewed.

Even with the minor discrepancy, *Stylo-Pak* is a very wise investment. When teamed up with PBJ's *Word-Pak* or *Word-Pak II, Stylo-Pak* is, without a doubt, the best word processing system for the Color Computer and raises it to new heights in the serious world of computing and word processing. It sets a new standard that other word processors will be measured against, and at this point, there are none that can compare. As you probably guessed, I give it my highest rating, and I had to create a new level to do that.

Stylo-Pak is available for OS-9 and is also available for FLEX. *Stylograph* is available alone for $99.95, *Mail Merge* and *Spelling Checker* for $59.95 and $69.95, respectively, or you can get all three in *Stylo-Pak*. When you first see *Stylograph*, be ready to dump the word processor you are now using.

(Stylo Software, Inc., P.O. Box 916, Idaho Falls, ID 83402, OS-9 or FLEX, disks $199.95)

Software Review

Calculating Parts Per Million

Does the Figuring for You

Applications are a lot less fun than utilities or even games, but their availability may mean a given computer system is going to stay around awhile. If so, CoCo is blessed.

Calculating Parts Per Million is a program that determines how much fertilizer to add to a given volume of water to achieve a specified ratio of parts per million. Its applicability covers the entire agricultural range, from the large farming business to the home gardener wondering how many tablespoons of fertilizer to put in a bucket of water. The arithmetic is simple enough, but tiresome to figure by hand, and such a program as this may be exactly what will simplify your day.

The program occupies 273 lines of BASIC and a small data file. In use, it is very simple. You are prompted at every stage and the documentation walks you through the whole program, step by step: whether you are using a tank or injector system, how much water is being used (less than 10 gallons affords you the option of seeing the amount of fertilizer to add expressed in tablespoons rather than pounds), how much nitrogen, phosphorus and potassium (in percentages, such as 20-10-20) for a number of fertilizers (as many as will be used in the mix) and desired parts per million of water. The program then does the necessary calculations and tells how much fertilizer to add.

Shortcomings? There is not room for many, really. It is irritating to have the program take you back to its sign-on message with any incorrect entry, wiping out everything that has already been entered. A space added before the word "tablespoons" in Line 1120 would make the screen presentation a bit more readable. However, this is an early version of the program, and these are precisely the kinds of annoyances that tend to disappear in the release versions.

The manual is one page of dot-matrix printout containing almost all you need to know. An exception appears under the heading "PPM" (Parts Per Million), where anyone unfamiliar with this concept is advised to "call their county agricultural agent for information concerning this." I suppose it would be fair to assume anyone looking for such a program as this would know what PPM stands for.

(Green Horizons, P.O. Box 768, Mooresville, NC 28115, disk $17.95)

— R.W. Odlin

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Go for the Gold in Fast and Furious *Gold Runner*

I'm sure you have heard of the "computer slump" and may have become concerned, as I have, at the situation. What does this mean to Color Computer owners? How will it affect our purchasing power and ability to buy good software? After some careful consideration, I came to the conclusion that although the computer market is very complex, one of the major drivers of this slump is the maturation of the consumer. He has become a much more wary purchaser of both hardware and software. One thing the slump creates is a "buyers' market," which should result in better quality products for lower prices. With this preface, I'll describe my impression of a new CoCo graphics/arcade game called *Gold Runner.* Remember that under the current conditions, only a very good product is likely to succeed.

Gold Runner was produced by Tom Mix Software, which has developed some of the more popular entertainment programs for the Color Computer. These include *The King* and *Trapfall*, among others. Well, *Gold Runner* lives up to this reputation for quality software.

Action in *Gold Runner* is fast and furious, but the game is simple. You operate a stickman around a vertical playing board of ladders, ropes and brick walkways, picking up blocks of gold. There are a few slight complications. Several guards chase you and, if caught, you lose a man. Also, there is an occasional invisible trapdoor that causes you to fall through the brick walkway. This may confuse the stickman, causing him to get caught. Fortunately, there is a tool to battle the guards. You can blast holes into the walkway, which traps the pursuing guards, or this can be used to drop the stickman to a lower level, eluding capture. Sometimes a gold brick is buried in a walkway and the only way to get to it is to blast a hole, then jump in. There is some risk that the hole will close and crush the stickman if you are not fast enough. Another complication arises from the need to steal gold blocks away from the guards, who sometimes carry them. Your stickman cannot touch a guard, so the strategy in this situation is to trap the guard in a hole that you blast and take the gold away.

Gold Runner is a multilevel game. Once all the gold blocks have been collected, including those in possession of the guards, your stickman can climb up the tallest ladder to the next screen. All together there are over 25 screens, with increasing levels of difficulty. If you should complete all the screens, you win the honor of starting over, this time with the challenge of two more guards in hot pursuit.

Gold Runner is a complete arcade game, with high score saved to disk, keyboard or joystick entry, and pause and restart as well as built-in voice sound. Unfortunately, I cannot comment on the sound feature because it requires the Radio Shack sound module and I don't have it. The game is great without it, so it must be even better with the sound module. The program is written in assembly language and requires 64K of internal memory.

My only minor complaint about the game is the slow drawing and erasing of new screens. The screen is drawn in a circular fashion, like looking through an ever increasing iris diaphram. This technique gives a nice effect, but it is easy to tire of after a short time.

In summary, *Gold Runner* is a well-developed arcade game that is fun to play. It's at the quality level and price I believe is needed to survive the computer slump. I recommend this product to the arcade game enthusiast or anyone looking for a fast-action, well-written game for the Color Computer.

(NovaSoft, 4285 Bradford N.E., Grand Rapids, MI 49506, requires 64K, tape $14.95, disk $17.95)

— Tom Szlucha

Hint . . .

Formatting Diskettes

Some CoCo users have reported problems with formatting more than one disk in succession. The CoCo uses a technique called "write precompensation" on the more critical inner tracks of a disk; for some reason, Disk BASIC doesn't turn off the feature after a `DSKINI` is completed. If you need to format more than one disk at a time, enter `POKE 113,0` and press the Reset button after each disk.

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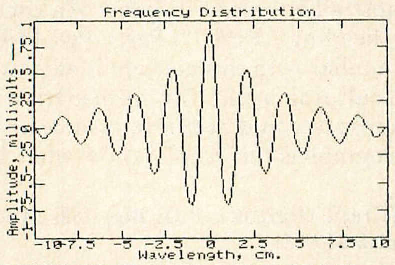

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Marble Maze Presents a Challenge for All Ages

I'm afraid this is going to reveal my age, but my first exposure to the subject of this review, *Marble Maze*, was not the electronic arcade version of the game, but its mechanical precursor, called "The Amazing Labyrinth Game." The "Labyrinth" game was made of wood and had a steel marble that was rolled around a maze using two knobs to tilt the playing surface. If you weren't careful, the marble would drop into one of the holes drilled in the board and you had to start over again.

This classic game has been converted into an arcade game for the Color Computer by Diecom Products. The basic elements of the original mechanical game have been retained, in that there is a marble and a maze, but the capabilities of the CoCo have allowed the programmer to add some interesting variations. Instead of gravity, the marble is controlled by the left joystick. The maze has been enhanced to be a multilevel game, where the goal is to "roll" your marble to the finish line in the shortest time possible.

As each level is completed, you are transported to a more advanced level, with each maze becoming more difficult. Dave Dies, the programmer, has added a few challenges to make the game more interesting.

First, if you aren't careful, your marble can fall off the edge of one of the mazes. Depending on the height of the drop, the marble will either be stunned or cracked. Then there are the "monsters of the mazes." The Marble-eaters are creatures that look like little Slinkies. They move end over end, wandering around the board waiting for a chance to eat a marble. Actually, they seem to be docile creatures until a marble bumps into them, then they jump into the air, land on your marble and eat it.

There are also the mysterious Acid Puddles that move around the board, shrinking and expanding as they go. If you roll your marble into one of these, it dissolves. Electric Snakes will also keep you on your toes as they slither around the maze. Unlike the Marble-eaters, these move quite quickly, but being touched by one also causes your marble to dissolve.

At higher levels, you are greeted by moving walls and transporter squares that move your marble elsewhere on the board (not necessarily where you want to go, just elsewhere).

One particular feature I like is that even if you get a little sloppy and your marble suffers as a result, the game is not over. Your marble is reincarnated at its last safe spot and the game continues. Each player is given a period of time to complete each maze. As a maze is completed, bonus seconds are given, which are used on the next level. The game is over when your time is up. The more skilled player will complete each level more rapidly, as it also takes time to get eaten and reappear on the board.

Marble Maze is a well-programmed game. The three-dimensional boards are well drawn. The control of the ball is very realistic, with the ball having a proportionate amount of inertia depending on the speed of the marble. The lower levels of the maze are easy enough for anyone, with adequate challenges for more advanced players at higher levels.

If you are good enough and have the disk version, you can enter your name, or appropriate alias, on the scoreboard section, which keeps track of the top six players.

If you are searching for a challenging CoCo game for all ages and skill levels, *Marble Maze* could be a ball.

(Diecom Products, 6715 Fifth Line, Milton, Ontario, Canada L9T 2X8, requires 64K ECB, tape or disk $29.95)

— Bruce Rothermel

One-Liner Contest Winner . . .

This one-liner is an example of a budgeting program.

The listing:

```
170 DIME(12):FORX=1TO12:PRINT"EA
RNINGS FOR MONTH"X;:INPUT E(X):N
EXT:PMODE4:SCREEN1,0:PCLS:FORX=1
TO12:FORY=0TO E(X)/10:LINE(Y,(X-
1)*16+4)-(Y,(X-1)*16+12),PSET:NE
XT Y,X:EXEC44539:CLEAR:GOTO170
```

Richard A. Sherman
Deposit, NY

(For this winning one-liner contest entry, the author has been sent copies of both *The Second Rainbow Book Of Adventures* and its companion *The Second Rainbow Adventures Tape*.)

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Super Directory Catalog Keeps Track of Disk Files

Super Directory Catalog is one of the latest software entries designed to help you keep track of all those disk files. To use this program you need at least 32K and either Disk BASIC 1.0 or 1.1. *Super Directory Catalog* is a very easy program to use. It is written in machine language and is menu driven.

The program has several menu options. "Read directory" reads the directories of each of your disks. Before each directory is read, you are asked for a directory name. This can be up to four characters long and is not written to the disk. A 32K machine will handle up to 1,700 filenames and a 64K machine can handle a whopping 3,800 filenames. "Save catalog" saves a master directory of the filenames, which can then be loaded with "Load catalog." "Print catalog" prints a catalog of your disk files, with up to 208 filenames printed four across on a page. A neat feature I haven't seen on other programs of this type is that at the bottom of each printed page, two filenames are printed in brackets. They indicate the first and last filenames on that page. The program can be ended by selecting "end."

Selecting "maintenance" takes you to a second level menu of the next six functions. "Sort" will sort the filenames in alphabetical order. The sort is quite fast — it sorted over 800 filenames for me in less than three minutes. The sort time increases exponentially, as the number of entries increases. It takes about 60 minutes to sort 3,850 filenames according to the documentation. The sort function is somewhat disappointing, though. Since it only does an alphabetical sort, you can't, for instance, get a printout of all your BASIC-only programs. This ability would have been a nice addition. "List filenames" displays all the filenames in the buffer to the screen. Twenty filenames at a time are displayed two across on the screen. "Delete filenames" allows you to update your catalog by simply deleting all the filenames on a particular disk and rereading the directory of that disk. This function deletes all filenames assigned to a disk, not individual filenames. "Selective search" helps you quickly locate a particular filename or all the files on a certain disk. All you have to do is type in all or part of the filename or the entire directory name. "Set default drive" allows you to select any drive from 0-3 as the default. "Clear buffer" clears all the data in the buffer.

Super Directory Catalog is a good piece of software that does exactly what it says it will do. I do feel the price is a little high, though, for what the program does. I recommend it, but for the price I think we deserve a little more.

(Metalsoft, P.O. Box 7796, Independence, MO 64054, $24.95 plus $2 S/H)

— Michael Hunt

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Good for Beginners, *Don Pan* is a Moderately Paced Game

Don Pan is the latest addition to the list of ROM Pak games for the Color Computer from Tandy. It's a gentle, moderately paced joystick game, just right for small children.

The game opens showing a girl holding a balloon. Magically, the balloon turns into a puffer fish and you play with the puffer fish for the rest of the game. I'm no expert in marine biology, but it seems these puffer fish need to replenish their supply of air regularly, or else they die. Your job is to capture enough balloons to keep your fish supplied with air, all the while avoiding the dangers that can puncture the fish.

The fish bounces up and down through the air, under control of your joystick. Balloons and birds float by: The balloons give you air and the birds puncture you. You can escape the birds by maneuvering around them or by blowing a puff of air, which makes them disappear. Points are scored by capturing the balloons and by blowing away the birds.

There are three screens. On the first screen, you're floating over an attractively drawn city scene. After scoring around 2,500 points, you go to a second screen where you fly above an ocean. Sharks occasionally jump out of the water and try to puncture you. On the third screen, where you go when you've scored about 7,000 points, you're over a seashore where you must avoid the crabs.

All through the game, you have to keep track of your air supply with the help of a gauge at the bottom of the screen. The air supply goes down as you fly around and whenever you "puff" at a bird. If the air supply gets too low, you can't puff at the birds until you've captured a few balloons to build up the air supply again. If you run out of air completely, you lose one of your three lives. You also lose a life if you're punctured.

Overall, the game is carefully programmed with attention to detail. Color and sound are used well throughout. One touch I like: When you're puffing at a bird, you don't have to be exactly lined up with the target — a near miss will do. This feature makes the game more attractive to younger players.

The game requires 16K and a joystick, and the instruction manual recommends a color TV — it really isn't enjoyable with a black-and-white set. For example, it's very difficult to see the sharks on Screen 2 on a black-and-white TV.

My children, ages 6 and 9, find many arcade games just too hard for them, requiring more speed and coordination than they can manage, but they found *Don Pan* a lot of fun and a challange they could meet. If you're looking for a beginning level joystick game, one that even young children can enjoy, try out *Don Pan* at your local Radio Shack store.

(Tandy Corp., available in Radio Shack stores nationwide, $19.95)

— David Finkel

Submitting Material To Rainbow

Contributions to THE RAINBOW are welcome from everyone. We like to run a variety of programs which will be useful/helpful/fun for other CoCo owners.

Program submissions must be on tape or disk and it is best to make several saves, at least one of them in ASCII format. We're sorry, but we do not have time to key in programs. All programs should be supported by some editorial commentary explaining how the program works. Generally, we're much more interested in how your submission works and runs than how you developed it. Programs should be learning experiences.

We do pay for submissions, based on a number of criteria. Those wishing remuneration should *so state* when making submissions.

For the benefit of those who wish more detailed information on making submissions, please send an SASE to: Submissions Editor, THE RAINBOW, The Falsoft Building, Prospect, KY 40059. We will send you some more comprehensive guidelines.

Please do not submit programs or articles currently submitted to another publication.

Two-Liner Contest Winner . . .

This two-liner is a simple subtraction flashcard program.

The listing:

```
100 R=0:CLS:PRINT@234,"SUBTRACT"
:PRINT@297,"FLASH CARDS":EXEC445
39:FORQ=1TO10:CLS:A=RND(20):B=RN
D(20):IF A>B THENPRINT@240,USING
"##";A:PRINT@271,"-";:PRINTUSING
"##";B:C=A-B:ELSEPRINT@240,USING
"##";B:PRINT@271,"-";:PRINTUSING
"##";A:C=B-A
101 PRINT@303,"===":PRINT@334,""
;:INPUT D:IFD=C THENPRINT@448,"c
orrect":SOUND200,1:R=R+1:EXEC445
39:NEXT:PRINT@456,R:EXEC44539:GO
TO100:ELSEPRINT@448,"wrong":SOUN
D10,4:EXEC44539:NEXT:PRINT@448,"
correct  ";R:EXEC44539:GOTO100
```

Richard A. Sherman
Deposit, NY

(For this winning two-liner contest entry, the author has been sent copies of both *The Rainbow Book Of Simulations* and its companion *The Rainbow Simulations Tape*.)

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SDOS: a Powerful, Low-Priced Package Perfect for the Hacker

By Tom Carl

I had looked forward to an evening of computer hacking with *SDOS*, a new software package from Software Dynamics, distributed by Computer Systems Distributors. Reading the manual makes it clear that *SDOS*, at least in concept and original form, was born on minicomputers and/or mainframes. Thus *SDOS* brings some very sophisticated techniques to the CoCo. It is definitely not for the beginner.

When I opened my reviewer's package from RAINBOW, out tumbled four diskettes, several pages of product promotion and seven manuals. It looked like I would have a hard time complaining about lack of documentation. I highly recommend that you start by reading the small manual, labeled "CoCo SDOS," cover to cover. It has a complete description of the keyboard modifications, which are actually very simple. The '@' key is used for erase (or rub out character), so the arrow keys can be reserved for full screen editing. The BREAK key is "escape" and the CLEAR key is "control." You also get auto-repeat on all keys and type-ahead (buffered input), with SHIFT/CLEAR being the upper-/lowercase toggle and SHIFT/@ being the '@' key. Therefore, you can get the full 96 ASCII codes and some other powerful keyboard features lacking in Disk BASIC. This little manual also tells you to start with `RUN "SDOS"` and warns of a 30-minute delay if you don't have your required registration number, which can be obtained by phone or mail from Computer Systems Distributors.

The *SDOS* formatter is run from a Command File. There is a command line interpreter (CLI) that has a vocabulary of some 35 words (such as files, list, time, do, dismount, etc.), and any word not in its vocabulary is assumed to be the name of a program you want the system to load from the disk and run. For example, if you type in FRED, the system will find a program called FRED and run it, or announce "no such program." As an alternative to typing in commands to the CLI, you can set up a Command File and put that Command File in charge of the computer by typing `DO XXXX.DO`, where `XXXX` is a filename. For those familiar with Data General Mini or IBM microcomputers, even the nomenclature of this feature will ring bells. *SDOS* also has a related feature similar to IBM's *AUTOEXEC.BAT*, which uses *INITIALIZE.DO* as a Command File that the Boot program automatically puts in charge of the computer at start-up time. The *SDOS* command to create a Command File is LIST CONSOLE: TO INITIALIZE.DO. You may also note that naming, initiating and releasing devices, such as LPT: D0: CONSOLE: D1:, are similar to larger computer systems.

I took the Utility disk and typed in `DISMOUNT D0:` so I could remove the System disk. The screen reported the number of I/O uses, and I was shocked to see that over 10 percent of all the reads had produced read errors, but, I had seen no apparent operational problems. I typed `FILES D1:` to look at the disk I had created, and it appeared to be OK, so I proceeded with the formatter Command File. It did its job just fine to the point of asking me, "Format another disk? Y/N." When I answered 'N', I got an Error 1045 (disk read error), then a steady stream of Error 1018s (system incompatible), and neither control/C nor escape could recover the system. I was ready to cry, for this meant waiting another 30 minutes for *SDOS* to come up again.

At least I had time for a cup of tea and some research into my disk read errors. I was using a 64K CoCo (required), a Radio Shack controller and two TEAC drives (a single drive will work but is strongly not recommended). The read errors and the slowness of the system suggested some type of disk speed problem, and my review showed that both SDOSDISKINIT and SDOSDISKBACKUP had the ability to manipulate MAPALGORITHM, which determines how files are laid out on the disk efficiently to account for rotational speed, seek time and transfer rates. When the system was ready to use again, I ran SDOSDISKINIT and found the best MAP parameter (the program can be told to try all 30 possibilities and let you know the best one). I was then able to build a system disk that ran without read errors, and the system was noticeably faster. The drive motors still are a lot slower turning off after use than with Disk BASIC.

If all of this sounds pretty technical, remember that this system is not for beginners. The manuals are well-written and you can learn from them, but they are not tutorials. "*SDOS* for the 6800/6809" is designed for use on several different computers, so the main manuals are written in generalized form. The CoCo *SDOS* manual was issued in 1984 and contains just those elements of *SDOS* unique to the CoCo; it refers you to other manuals for all other information.

This type of organization has its pros and cons. The system developer can afford to invest more time and money in a system with broader use, which means more quality and breadth of features. On the other hand, more compromises may be necessary to fit an operating system to several computers, plus the user is forced to juggle manual information that isn't always in ideal order for his computer and is also more likely to contain conflicting information. I ran into some conflicts of this type with *SDOS*, but the power of the system greatly outweighed these minor problems.

The DISMOUNT command, which is required before removing a diskette, is somewhat of a nuisance, but it buys you some very nice features. First of all, you get I/O Error reports that indicate, before your disk drive and diskettes are in big trouble, that problems are building. Even Disk BASIC probably tries to reread a record up to 10 times before reporting an error (this is standard on bigger computers), but you never know how desperately your computer is struggling to get a record written or read. The *SDOS* record keeping of these so-called "soft read" errors leaves no doubt in your mind about the status of your drives and diskettes.

SDOS keeps in memory the last "files" data so it can update directory and disk maps without disk accesses. For application programs, it dynamically buffers good size chunks of files, so disk accesses are cut down. This is all very important to the speed of system operation. There is also a "Keyed File Package" for those wishing to do data management, and the system keeps track of all file space so records can overlap sector boundaries. This record management is completely transparent to the user at both design and operation time.

There is a LOG feature that permits automatic capture of the keyboard dialog, which is beautiful for debugging and transaction recording. There is a built-in debugger that is activated at any time with control/D. The *SDOS* system comes with an assembler, text editor and debugger, all at one low price. *SDOS* does not read Disk BASIC disks directly, but there is a utility program that can bring data from Disk BASIC disks to *SDOS* disks. *SDOS* can handle up to 128K, and Computer System Distributors promises a version able to handle hard disks soon.

SEDIT and *TYPE* together make up the *SDOS* word processing package. They are issued as two programs because each can stand alone, the *TYPE* being able to message and print data from many sources other than *SEDIT*, and *SEDIT* being able to do more than just word processing. They also require the *SDOS* operating system. I have used three major word processing systems written for the CoCo and the *SDOS* very much resembles one of these systems. I disagree with CSD that *SEDIT* is easier to use than most word processors: Margin handling is confusing. A short tutorial covering the most common tasks would greatly improve the documentation. The fact that you must use reverse video for lowercase letters and having only a 32-character screen mode are major drawbacks in my estimation.. Of course, you do get increased speed in many of the more complex operations this way. *SDOS* can handle modem cards and an external CRT, so you can get 80-column operation this way.

TYPE can print data in variable widths and do so with automatic justification. It uses embedded commands of a wide variety. I found these functions work well and, for the most part, are easy to invoke. *TYPE* also has merge capability. The *TYPE* manual has over 50 pages, including the addendum, and there's no way can I do justice to this program with the little use I was able to give it. Suffice to say, *TYPE* is a very thorough piece of software. You can learn the basic steps quite quickly and easily, and when you need to do something sophisticated, chances are good that *TYPE* can do the job.

To sum up, I think the *SDOS* system and its family of programs are generally well-documented, well worth the money, well-designed and as stable a group of programs as you are likely to find. In spite of this, I think there are many people who will not find *SDOS* their cup of tea, but for the CoCo computer hacker, *SDOS* is a powerful and cheap paradise.

(Software Dynamics, distributed by Computer Systems Distributors, P.O. Box 9769, Anaheim, CA 92802, *SDOS*, editor, debugger and assembler $49.95, *SEDIT* and *TYPE* $49.95)

See You at RAINBOWfest-Chicago May 23-25

House Doc — an Electronic Doctor Who's Always on Call

"Take two aspirin and call me in the morning" is the typical response when asking an off-duty physician about a medically related problem. To alleviate this dilemma, we now have *House Doc*, an electronic doctor who is always on call.

House Doc owes its creation to Darrell Wells, M.D., Ph.D. Hardware requirements are a CoCo 2 with Extended BASIC and a disk drive. The copy-protected program is very easy to understand and operates extremely well. The attractive 16-page manual contains a medical glossary, descriptions of tests and procedures, and prescription information. The manual also states a precaution that "*House Doc* is designed to help you with your medical conditions" and is *not* meant to replace your family physician.

Upon executing *House Doc*, several introductory screens are displayed. Two of them ask the patient's name and sex. The former aids the doctor's bedside manner whereas the latter assists in narrowing the symptoms/diseases applicable to that gender. From here the patient chooses from a list of 18 symptoms for further analysis, or to a specific disease, of which 35 are listed.

If the symptom option is chosen, the doctor queries the patient on various aspects of the problem. After the questioning is completed, Dr. CoCo consults his "in-house library" (66 granules are used on the disk) and relies on his extensive experience to list, in order of probability, the diseases that may be causing the symptoms. Once the patient agrees to one of the diagnoses, the doctor gives his prescription for healing. These range from taking vitamins to changing eating habits, among others. If the medical problem appears to be serious, *House Doc* issues a loud warning notifying the patient to consult a physician immediately. If the disease option is chosen, the patient can learn about the disease, its causes, consequences and cure.

In testing the diagnosis function, my wife and I entered the symptoms from medical problems we had experienced in prior years. *House Doc* accurately diagnosed each ailment we had experienced! We both found *House Doc* interesting, informative and fun to use. With the high cost of medical care, the program can save trips to the local doctor by successfully diagnosing medical problems that can be remedied at home. Furthermore, when a medical visit is required, one can talk more intelligently about the problem to the doctor by first consulting *House Doc*.

My only reservation with the program is the disk protection routine. The manual states that if a disk crashes, the user must resort to a disk repair utility. I would prefer a protection method similar to the one used by *DynaCalc*, where the master disk makes runnable programs that cannot be copied. At the very least, the author could have provided two disks.

Regardless of this, *House Doc* is an excellent program and would be welcomed in any household; just think, when someone asks if there is a doctor in the house, you can pull out your floppy disk and say, "Yes!"

(For Your Health Software, 58-A Star Rt., Coalmont, TN 37313, disk $59.95)

— Dan Smith

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Pin 3 from the RF modulator and any PC Board ground will give you audio output that you can send to any outside amplifier.

Incidentally, Pin 3 is the third pin back from the rear of the 80C on the RF modulator.

You should remember that opening the computer case will void your warranty.

Software Review

Create Dazzling Graphics with *Micro Illustrator*

Micro Illustrator is a graphics creation program that is an adaptation of the MS-DOS program by the same name. It requires a 64K CoCo with a disk drive. The program also runs under OS-9, however, OS-9 is not needed to run *Micro Illustrator.* If you have a CoCo with BASIC Version 1.1 or later, all you need do is enter the DOS command to boot the program. If not, there is a BASIC routine provided in the manual that boots OS-9 from the *Micro Illustrator* disk.

Micro Illustrator uses both the keyboard and a joystick (or mouse) for command and control of operations. While most commands are presented on the screen in the form of icons, they can also be executed from the keyboard by single keystrokes. This can be very useful since the icons are displayed on a separate screen. In fact, there are two screens of icons. The first screen lets you select drawing mode, brush shape and color. The second screen contains a selection of patterns and colors.

Let's take a look at the drawing functions of *Micro Illustrator.* The first function you see on the menu is DRAW. DRAW provides the capability to do freehand drawings. While holding down the joystick button, the cursor produces a trail in the selected color. You are given two line functions for drawing straight lines, LINES and LINE. Both functions operate in similar fashion. The difference is that LINES produces a series of connected lines, while LINE is used to produce unconnected lines. These functions use the rubber band method of drawing. The start of the line is fixed when you press the joystick button the first time. You are then free to move the end point of the line to the desired position. The second press of the joystick button actually draws the line.

Micro Illustrator provides a FRAME function that can be used to draw a rectangular outline. One press of the joystick button defines one corner of the frame. By moving the cursor, you define the size and proportions of the frame. The second press of the button makes the frame permanent. The CIRCLE function operates similar to FRAME. Two other functions similar to FRAME and CIRCLE are BOX and DISK. BOX is used to draw a solid rectangle with the selected color or pattern. DISK produces a solid circle. There is also a FILL function, which allows you to fill in any enclosed area with a selected color or pattern. Another "painting" type function is SPRAY. This produces a spray paint effect.

If you need to reproduce objects or areas of the screen, *Micro Illustrator* makes it easy. It gives you a COPY function. Just outline the object, press the joystick button and you can move the object anywhere on the screen and make replicas of it. There is also a ZOOM function that magnifies any portion of the screen and lets you use any of the drawing functions to produce better details.

Micro Illustrator has two more functions that really make it fun to use, MIRROR and RAYS. The mirror function is the most complete of its kind. You not only get horizontal and vertical mirrors, diagonal and radial mirrors can also be selected; you can even select any combination or all mirrors! Some very exotic designs can be produced with the different combinations of mirrors.

The most unusual function is RAYS. You move the cursor to a starting point on the screen and press the joystick button to fix the center point. Next, move the cursor to define the length and start of the rays. The final step is to move the cursor while holding down the joystick button. This produces a series of lines radiating from the center point. The spacing of the lines depends on the speed at which you move the joystick. Some extraordinary effects can be produced with RAYS. Combining RAYS with MIRROR creates dazzling artistic effects.

Micro Illustrator is not only easy to use, it is fun to use. In fact, I should warn you that when you are using it, you may forget about time and all the other things that need to be done around the house!

(Tandy Corp., available in Radio Shack stores nationwide, requires 64K, disk $29.95)

— Mike Piotrowski

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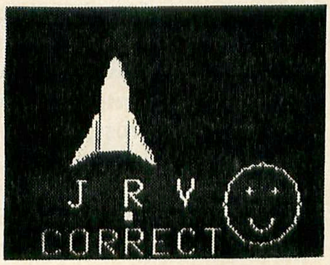

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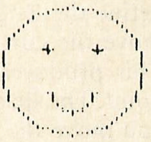

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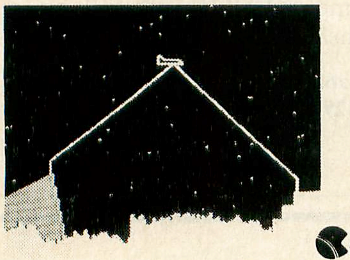

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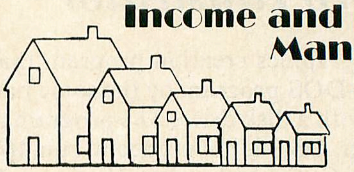

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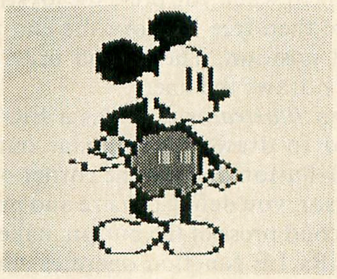

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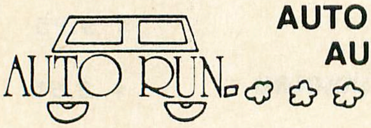

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Use your CoCo, your 8-bit dot addressable graphics printer and the **CoCo Calligrapher** to create beautiful signs, invitations, flyers, greeting cards, diplomas, certificates, awards and love letters.

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Old English Cartoon

Gay Nineties

Gay Nineties

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These tapes of additional typestyles are available for **$19.95 each**. They can be easily moved to disk. ***The original Calligrapher program is required.***

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uvwxynoldsbabcde

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Broadway Oldstyle

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*These disks of additional typestyles are available for **$49.95** each.*

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Wild West Checkers

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Stars שלום

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COMPUTER

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*These disks of additional typestyles are available for **$49.95** each.* They are not compatible with the **CoCo Calligrapher** typestyles or program. OS-9 typestyle disk must be used with the **OS-9 Calligrapher.**

Disk 1 - OS-9 version of all type styles on Tapes 1, 2 and 3.

Disk 2 - OS-9 version of all type styles on Tapes 4, 5 and 6.

Dealer and author inquiries are always welcome. Canadian dealers should contact Kelly Software Distributors, Ltd., P.O. Box 11932, Edmonton, Alberta T5J-3L1, (403) 421-8003.

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Geography USA is an Excellent Learning Tool

Did you know that Concord is the capital of New Hampshire or that Pierre is the capital of South Dakota? How about this: Did you know the capital of New York is not New York City but Albany? I'm sure you know the answers to these pieces of trivia if you live in those states, but in Utah, where I live, if it is east of the Rocky Mountains I could not be sure if it is in the United States. If you want to learn the states and capitals but are a little afraid because your spelling is the pits or you can never remember what state is next to what, this could be the program for you.

Geography USA is written for the 16K standard CoCo. The program is in five short segments so each part can fit into the memory of a 16K machine. You can also get the program on disk and use it on an Extended 16K, 32K or 64K machine. The program is started by loading and running `"USA"`. You have a choice of nine sections of the United States with which you would like to work. If you have a disk drive they may be done in any order, but with cassette, you must do them in order or wait for the recorder to find the next section, which can take a minute or two.

When you get to the chosen section of the country, you can then choose if you would like to answer just the state names, the capitals, or both, the major cities or the major products. No matter what is chosen, you first see the states and then the answers. When you have studied enough, press any key and the computer tests your memory. If something is spelled wrong you still get credit for it, but it is noted that it was spelled wrong.

Considering the limitations of a standard BASIC computer versus the Extended BASIC computer, the program is pretty good. The scope and sequence of the material covered is done in small enough steps that concepts can be easily learned. It is also forgiving to the person who can remember the states but doesn't know how to spell them. It gives credit for knowing a state, but gives more credit if you spell it correctly. I think that is a strong point for this program. You can learn the states without being frustrated because of spelling.

I think this program would be better if there were a version made for the 32K or 64K machine and put on disk or tape as one progam, not five. Having the program written in standard BASIC is not a major detraction from its appearance or usefulness; as a matter of fact, having eight colors to work with is nice when working with maps, but it is somewhat of an inconvenience to own a disk drive and 64K machine and have a program that does not utilize all of the machine or is always going to the disk and repeating some of the steps in each section of the program.

Now, would I buy the program myself? If all I had was a 16K standard BASIC CoCo, I think it is a good program to have. It is written in a professional manner and has a sound sequence in its curriculum for teaching and testing the states. I don't think that using just standard BASIC is a major hinderance, but it would be nice if there was a version for owners of larger CoCos.

(Viking Inc., 910 Soo Blvd., Rice Lake, WI 54868, cassette or disk $19.95)

— Thomas E. Nedreberg

The Coco Greeting Card Designer

The Coco Greeting Card Designer is the perfect program for the Holiday Season! You can Create and Print custom Greeting Cards to send to Friends and Relatives.
The Coco Greeting Card Designer can be used to design and print custom Greeting Cards for all occasions including: Thanksgiving, Christmas, New Years, Birthdays, Valentine's Day, Mother's Day and others. It can also be used to make custom Invitations, Thank-You Cards, Get-Well Cards and Announcements.
The Coco Greeting Card Designer is easy to use and includes a library of predrawn Hi-Res Graphic Pictures! You can write custom messages on the cover and inside your cards in a selection of character fonts and sizes. An easy to use screen editor allows you to pick your type style, font size and more. Two fonts are included, and the easy to use editors allow you to create many more! Also included is a selection of border patterns.
The Coco Greeting Card Designer requires a Coco or Coco II with a minimum of 32K, One Disk Drive (Compatible with: Disk BASIC 1.0 & 1.1 and JDOS.), and one of the following printers: EPSON RX/FX, GEMINI 10X or SG-10, C-ITOH 8510, RS DMP Series, GP-250 and GORILLA BANANA.

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Hint . . .

Saving in ASCII

When you save programs, CoCo can perform this function in two ways: by using binary codes or actual letters and numbers (called ASCII and pronounced "as-key").

Although it takes longer, ASCII is sometimes a more accurate way to save a program, especially when you may be transferring programs between systems — say from a disk-based to a cassette-based system.

To save in ASCII, simply add a comma and an 'A' to the end of your `SAVE` instruction, like this: `CSAVE"PROGRAM",A` and the ASCII save is done by CoCo.

The BMC Monitor Stand Makes CoCoing More Comfortable

Are you leaning left and right in your chair to see what your monitor is saying? Have you tried your hand at inventing devices to block the glare that plagues every computer user?

If you answered yes to either of these questions, the BMC Pan-tilt Model PA-900 monitor stand from Spectrum Projects can help you make your time at the computer more comfortable.

This stand, designed for 12-inch monitors, not only revolves a full 360 degrees, it also tilts up or down 12.5 degrees. To give you some idea of what a 12.5 degree tilt means, let it suffice to say it can accommodate anyone from a 3 foot tall child to a 7 foot tall giant.

Viewing is easier and computing more comfortable with an accessory such as this. Glare is no longer a problem because the monitor stand lets you rotate your monitor to avoid eye-level light sources, as well as tilt it to avoid the glare of ceiling lights. At the center of the stand platform is a butterfly nut which can be tightened to avoid accidental tilting. It is necessary, however, to remove your TV or monitor from the stand to adjust the nut.

Surely, you've experienced the need for more than one person to see the monitor at the same time. I've welcomed friends to my home to play with my computer and have noticed that they end up with either a crick in their neck or sore feet from standing behind me. With the BMC monitor stand all I did was push in the right direction and the monitor was swiveled to a position which was comfortable for my friends, and they left me and my CoCo in the same state of health they were in when they came over.

The BMC Pan-tilt instructions come on a single sheet which describes the angles of revolution and tilt, as well as how to adjust the stand and how to place the monitor for best results. The instructions are written in both Japanese and an amusingly stilted English. Example: "When putting CRT monitor on pan-tilt, put CRT monitor so as not to give shock to pan-tilt." In other words, don't set your monitor down so hard you break the plastic stand. Actually, the stand appears quite sturdy and well-made. The last of the five easy instructions, each illustrated, tells you not to place the monitor so far forward on the stand that it tips over into the floor; that's good advice, too.

The stand comes assembled and ready to go right out of the box, complete with non-skid padding to keep your monitor safe. It is cream colored, which blends well with most any equipment or furniture you may have.

I think the BMC monitor stand is a good addition to anyone's computer equipment collection. The easy adjustment, safe placement of your monitor and comfort afforded are worth the cost of the stand.

(Spectrum Projects, Inc., P.O. Box 21272, 93-15 86th Drive, Woodhaven, NY 11421, $24.95 plus $3 S/H)

— Jim Sewell

The RAINBOW

THE COLOR COMPUTER MONTHLY MAGAZINE

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Back copies of many issues of **THE RAINBOW** are still available.

All back issues sell for the single issue cover price. In addition, there is a $3.50 charge for the first issue, plus 50 cents for each additional issue for postage and handling if sent by United Parcel Service. There is a $5 charge for the first issue, plus a $1 charge for each additional issue on orders sent by U.S. Mail. UPS *will not* deliver to a post office box or to another country.

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Note: Our Fourth Year Index, including an index to all editions of RAINBOW ON TAPE, is included in the July 1985 issue.

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CoCo Incognito is Packed with Useful Information

If you are a loyal subscriber to RAINBOW, you have probably seen many POKEs and PEEKs that allow you and your CoCo to do some amazing things. However, how many times have you wanted a particular PEEK or POKE, but could not remember where you had seen it? Unless you keep a very good record of all those hints that RAINBOW and its subscribers have given throughout the years, you will not know where to look for all these little goodies. Besides the hints, there are other schemes that allow the CoCo to do all kinds of things.

You are probably saying at this point, "Where can I get all this wonderful information?" Enter RC Creations. RC Creations has released *CoCo Incognito*. This booklet contains 25 pages of information with approximately 10 PEEKs, 60 POKEs, 20 EXECs, 25 BASIC subroutines, 10 machine language subroutines and 45 game hints and tips. This is RC Creations' second booklet of hints and tips; their first was *System Secrets*, reviewed in the September 1984 RAINBOW.

As with their previous booklet, the information contained in *CoCo Incognito* has probably been listed somewhere before. While I had seen some of the information before, many items were new to me, and even the items I had seen before, I would not have known where to look for them when I needed them. It is really nice to have all this information at your fingertips, all in one place.

CoCo Incognito could possibly have come up with a product that has something for everyone. If you play games, you will be interested in the schemes to increase the number of tokens or the speed of certain games. Other game options are also included. On a more serious note, there are modifications to BASIC and Extended BASIC commands and key words. Also included are tips to work with text and graphics for the text screen and for using Hi-Res graphics. You must realize that some of this information is for advanced programmers, i.e., *you* have to know how to use the information. However, you do not have to be an expert to find this booklet useful. Novice programmers will find much of it helpful, and as the information is used, it should even improve their knowledge of the CoCo.

If you are either a serious programmer or someone who just likes to play with the CoCo, there is plenty of information packed in these 25 pages. At $7.95, it makes an excellent reference source for your CoCo bookshelf.

(RC Creations, 17251 Palatine N., Seattle, WA 98133, $7.95 plus $1.50 S/H)

— Dale Shell

CoCo Calendar Can Help You Get Organized

The *CoCo Calendar* from Spectrum Projects is what those who want daily reminders need. The *CoCo Calendar* can't make dates for you, but it certainly will help you keep them. When the program is run, the user is asked for the current date. After that, any memos for that day are displayed. After reading the memos the user hits the space bar and a Hi-Res calendar is displayed.

The calendar is well designed and attractively displayed. If there is a memo for a particular day in the month displayed, the user sees a small black box underneath that day. At the bottom of the calendar is a help section which reminds the user of the available options. These options consist of changing the target date, entering the memos necessary to keep track of appointments, schedules, birthdays, etc., deleting a memo, reading a memo, returning to BASIC, or using a screen dump the user provides to dump the Hi-Res calendar.

The change target date is provided to allow access to information at a date different than that entered at the beginning of the program. The enter, delete, read and return to BASIC are all self-explanatory and need no further elaboration.

The print option is provided so one can use any of many screen dump programs to print the Hi-Res calendar. Notice, the *CoCo Calendar* has no dump program incorporated into itself.

There is another print feature available while reading a memo. After the memo for the chosen day is read, the program asks if it is to be printed. Answering yes will give a text printout of the memo date, followed by the memo itself.

The instructions that come with the *CoCo Calendar* are sufficient and inlcude explanations of each feature, as well as ways to save the Hi-Res screen to disk and to keep more than one memo per day. This documentation is thorough, but concise, which is welcome in any utility.

Memos entered are stored into a data file on the working disk and are separated by year. That is to say, all memos for 1985 will be stored into a file called "1985/DAT." This allows hundreds of memos to be entered for each year and easy manipulation of entire years. By this means one can store each year in an archive or delete it entirely when finished with it.

Overall, I think the *CoCo Calendar* is a useful program for those of us who either need daily reminders or wish to be more organized without spending countless hours getting that way.

(Spectrum Projects, Inc., P.O. Box 21272, 93-15 86th Drive, Woodhaven, NY 11421, 32K/64K disk $24.95 plus $3 S/H)

— Jim Sewell

TX is a Modest Word Processor Written in BASIC

TX is a modest word processing program written in BASIC. It supports a maximum buffer capacity of one page: 66 lines of 80 characters. The default is all uppercase. It is possible to get upper- and lowercase by SHIFT locking, SHIFT 0. The default then becomes lowercase, with the characters appearing on the screen in reverse color. Uppercase may be had by the use of the SHIFT key, as usual.

The screen display is Lo-Res CoCo standard, 32 by 15. *TX* treats this as a window over the page/buffer, so as one begins text entry the cursor moves in the normal manner, left to right. Once the point is reached where the windowed area corresponds to the right segment of the page, the cursor appears to stand still and the text moves leftward as entered — in other words, the "page" moves under the "window."

TX loads (and by the way, because there is a PCLEAR 1, you may have to enter RUN twice) to a main menu, offering disk I/O, print (buffer or marked block therefrom), buffer clear ("cancel"), disk directory and text entry (a screen editor with word wrap) as options. CLEAR acts as a "control" key, bringing up the main menu; or with SHIFT, a means of moving to the alternate mode from which insertions may be made; a block, line or column of characters may be marked off and manipulated (including calculation of such numerical values as are in the marked-off block); and single characters may be repeated: across a line, down a column or (for whatever reason one might want to do so) along a diagonal. The documentation, while by no means elegant or ample, is sufficient to get *TX* up and running.

As mentioned, *TX* is written in BASIC. Therefore, even with the high-speed poke its function is very slow, even at a hunt-and-peck typing rate. Anything over about two characters a second results in lags and letters being left out; you are slowed up further by having to constantly backtrack and make corrections. The limitation in buffer capacity and print format need no further comment.

Comparisons are awkward and inappropriate in a review. Nevertheless, it is only fair to ask the question: Is *TX*, for all its limitations, a good buy at its modest price, which is 25 percent or less than that of the "heavies" among CoCo word processors? Candidly, I think not. There is at least one word processor in the approximate price range of *TX* offering the speed and accuracy of machine code, a buffer of disk size or, in the case of tape, over 50K, and a variety of print format options. Although I have have not had occasion to use that particular program in my own writing for some time now, I fired it up to draft this review, as a sort of "control" alongside *TX*. My advice? Even at its price, even for short items and even (or maybe especially) for a youngster or adult taking his or her first steps in using a word processor, *TX* is simply too limited and slow to be considered a serious option.

(Kolesar B/S, 7 Ladd Rd., Westfield, PA 16950, disk $12.95 plus $2 S/H)

— John Ogasapian

Here by Popular Demand: New Delphi Enhancements

By John R. Curl
Rainbow's CoCo SIGop

Happy Ides of March! I hope the command card printed in last month's issue has given you a better understanding of Delphi. We here at THE RAINBOW will continue to bring you the best information we can. I have several important items to pass along in this month's "Delphi Bureau."

The substantial increase in DATAPAC rates have the most import, especially to our Canadian friends. Following is the official explanation given to THE RAINBOW of the reasons for the increase in rates.

"DATAPAC is a packet-switched network, which has had somewhat of a monopoly in Canada for some time. Its rate schedule is complex in that it charges by kilocharacters of data transferred. There is apparently some sort of arrangement with Tymnet and Uninet, whereby the two U.S. carriers bill Delphi for the DATAPAC usage connected through their respective network.

"Delphi's analysis of the situation in November revealed that when they computed the kilocharacter charges billed to them for access from Canada, the charges averaged around $12/hr. just for the Canadian portion. Delphi decided then to raise the surcharge (which is currently $3/hr.) to $12/hr. in order to more accurately reflect their cost of allowing access from DATAPAC through Tymnet and Uninet. The price list was updated in the "Using Delphi" section (available from the MAIN> menu prompt) at that time. Delphi apologizes for not posting a general announcement at the same time.

"There are now, and will in the future, be other alternatives for accessing Delphi from Canada:

"1) Tymnet has a node in Toronto and will be adding the other major cities early in the year. Uninet also plans to add Canadian nodes to its network. The rates will only be slightly higher than U.S. rates.

"2) There is some sort of promotion going on by Bell Canada, called INET2000, whereby subscribers to INET can "gateway" into Delphi (via DATAPAC) for a flat rate — around the clock — of $16/hr.

"3) Access through DATAPAC directly to Delphi will be $18/hr. in the evenings and weekends, and $28/hr. during the business day. Delphi says these rates are lower than CompuServe's 1200 Baud rates for DATAPAC users as far as Delphi can determine from CompuServe's price sheet.

"All of these rates are quoted in U.S. monetary funds."

As you can imagine, this is also distressing news to us at RAINBOW. I'm afraid we will have to live with this arrangement for the time being. I will keep you posted as things develop.

Now for some encouraging information. Here, by popular demand, are some recent Delphi enhancements. All of the following list applies to the "CoCo SIG Forum" section.

1) The READ command now accepts all of the same arguments as the DIRECTORY command, including ranges, FROM x TO y, SUBJECT and

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RAINBOW technical assistant and CoCo SIGop John Curl is also a military policeman in the Army National Guard. He has had his Color Computer since 1982. He and his wife, Becky, live in Louisville, Kentucky.

THREAD, and has been made generally more consistent with the DIRECTORY command.

2) The READ and DIRECTORY commands now accept the argument NONSTOP (or NS) on any valid command, e.g., READ NEW NONSTOP, READ FROM RAINBOWMAG NS, READ WAITING NS, READ THREAD 122 NONSTOP, etc. This feature allows messages to continuously scroll by without having to repeatedly press ENTER.

3) At the end of a thread read by using the FOLLOW command and subsequent carriage returns, pressing ENTER ("READ NEW") takes you to the next message you would have read had you not typed FOLLOW. This means you may never have to see message number 12 again. This should fill Marty Goodman with elation.

4) The DELETE command now includes the message number in the confirmation.

5) The (Forum contains messages x through y) message is now kept more accurate.

6) A partial range entered (such as 27:), e.g., DIR 27:, is now acceptable.

7) The DIR command displays output more closely matching the current line length (/LENGTH command).

8) ENTER pressed by itself generally means "NEXT" after an initial READ or DIRECTORY command until it can deliver no more matching messages. In this case, it is interpreted as READ NEW. Pressing ENTER also means READ NEW after an ADD command or after a DELETE, REPLY or EDIT command with a number as an argument, since these commands implicitly destroy the context of what you were doing by going directly to a message.

9) REPLY now takes an optional message number as an argument, so it is no longer necessary to re-read a message in order to post a reply. The message number must be the first argument, if used, along with the MAIL option, e.g., REPLY 27 MAIL.

10) READ <number> takes you to the next available message if the number selected has been deleted or is inaccessible.

11) QUIT takes you out of the Forum section without updating your high message pointer. This is useful when you have followed a thread (thus updating your temporary high message pointer), have not gone back to read the intervening message (or messages in other topics) and you want to come back to them at another time.

12) You can now cancel (Control-C) a REPLY without damaging the context. A subsequent REPLY then works correctly. This eliminates empty messages in the Forum section.

13) ALL is a valid option on the READ NEW and DIR NEW commands, causing the Forum to ignore the "temporary map" of messages you have read during the current Forum session. DIR NEW ALL prints an asterisk beside any "unread" messages on the current listing. This listing is useful if you have been following threads around and want to find a particular message.

14) The NEW option on the READ and DIRECTORY commands causes the Forum to select messages higher than your high message pointer that you have not read during the current Forum session (which meet your other options and topic criteria). The NEXT command in any READ context also causes the Forum to skip any messages already read during the current session unless the ALL is specified as an option on the READ command.

15) The HIGH command clears the "temporary map" of read/unread messages. This sets your permanent highest message read.

The foregoing represents Delphi's response to a number of suggestions and complaints voiced here and in other SIGs. The features just mentioned have been heavily tested, but if any unusual responses occur when you use them, THE RAINBOW would appreciate a message from you, which we will forward to the good folks who made these needed changes for us.

Sound Off!

The CoCo SIG can only be made better if we know what you expect. As you can see, your hints and suggestions have not been made in vain. We encourage you to continue to tell us of enhancements and additions you would like to see made to Delphi. We have been assured that every serious suggestion will be considered.

Public Domain Programs

Now on to what has become a regular "Delphi Bureau" feature and a personal favorite of mine, the list of CoCo SIG members who have uploaded public domain programs into our databases.

Devin Cook (ELECTROMAGIC) ***File-diss:*** In the Assembly Language topic, this is a file disassembler for Radio Shack DOS. It allows you to build a file of table definitions and equates. Also included are *Ident/bas*, which identifies the start, end and exec addresses of a binary file, and *Compare/bas*, which is a byte-by-byte comparison of binary files.

William Borie (DISKBANK) ***COLORAMA/PIX:*** In the Graphics topic, this is a picture of the Colorama of Louisville BBS created by Tom Carmin using *CoCo Max*. This is an ASCII BASIC program.

Bob Patten (N4BP) ***Musica File Squeeze:*** This is a collection of programs that convert *Musica 2* files from binary to ASCII format and back. Also included is Bob's arrangement of Chopin's "Minute Waltz" in ASCII format. This group can be found in the Music topic.

William Borie (DISKBANK) ***REDIAL/BAS:*** This ASCII BASIC program found in the Data Communications topic continuously dials a BBS number until it detects a carrier. It will then `LOADM` and `EXEC` *Mikeyterm*. You can edit it and make it load your favorite terminal program. This program only supports the "bit-banger" serial port on the back of the Color Computer.

Stephen Macri (DRACMAN) ***KELLYII/BAS:*** Found in the Games topic, *Kelly Checkers II* is a checkers game with two players playing against each other or one player playing against the computer. This program uses a high resolution text and graphics screen.

We invite you to upload any public domain programs that you feel the rest of our members would like. We want to see more member participation in the Database section so the SIG will have a better collection of programs to offer.

Once again, I invite you to join us on Delphi's CoCo SIG. We like to hear first-hand from our readers (it gives us a feeling of accomplishment). We're always here ready to answer questions or help with a problem, so join us and become an active member in the realm of CoCo communications!

"The CBASIC Compiler"

Now anyone can create fast efficient Machine Language Programs Easily and Quickly without having to use an Editor/Assembler

CBASIC is a fully integrated, easy to use Basic program Editor and Compiler package. CBASIC is 99% syntax compatible with Disk Extended Color Basic programs, so most Basic programs can be loaded and compiled by CBASIC with little or no changes required. The compiler is an optomizing two-pass integer Basic compiler that can convert programs written in Disk Extended Color Basic into 100% pure 6809 Machine Language programs which are written directly to disk in a LOADM compatible format.

The programs generated by the compiler can be run as complete stand alone programs. A built-in linker/editor will automatically select one and only one copy of each subroutine that is required from the internal run-time library and insert them directly in the program. This eliminates the need for cumbersome, often wasteful separate "run-time" packages.

CBASIC WAS DESIGNED FOR BOTH BEGINNING & ADVANCED USERS

CBASIC is a Powerful tool for the Beginner or Novice programmer as well as the Advanced Basic or Machine Language programmer. The Beginner or Novice programmer can write and compile programs without having to worry about Stack Pointers, DP registers, memory allocation, and so on, because CBASIC will handle it for you automatically. All they have to do is write their programs using the standard Basic statements and syntax. For the advanced Basic and Machine Language programmers, CBASIC will let you take command and control every aspect of your program, even generating machine code directly in a program for specialized routines or functions.

CBASIC adds many features not found in Color Basic, like Interrupt, Reset, and On Error handling. It also has advanced programming features that allow machine level control of the Stack and Direct Page registers, variable allocation, automatic 64K RAM control, program origin and even multiple origins. It can even have machine language code generated within a program that executes just like any other Basic program line.

FULL COMMAND SUPPORT & SPEED

CBASIC features well over 100 Basic Commands and Functions that fully support Disk, Tape, Printer and Screen I/O. It also supports ALL the High and Low Resolution Graphics, Sound, Play and String Operations available in Extended Color Basic, and all with 99.9% syntax compatibility.

CBASIC is FAST. Not only will CBASIC compiled programs execute 10 to 1000 times faster than Basic, but the time it takes to develop a CBASIC program versus writing a machine language program is much, much shorter. A machine language program that might take several months to write and debug could be created using CBASIC in a matter of days or hours, even for a well experienced machine language programmer. We had a report from a CBASIC user that claimed "a Basic program that used to take 3 hours to run, now runs in 7 to 8 minutes". Another user reported a program that took 1 to 1½ hours to run in Basic, now runs in 5 to 6 minutes!!!

MORE THAN JUST A COMPILER

CBASIC has its own completely integrated Basic Program Editor. The Editor contained in CBASIC is used to Create and/or Edit programs for the compiler. It is a full featured editor with functions designed specifically for writing and editing Basic programs. It has built-in block Move and Copy functions with automatic program renumbering. Complete, easy to use inserting, deleting, extending and overtyping of existing program lines. It is also used for Loading, Saving, Appending (merging), Killing disk files and displaying a Disk Directory. It also has automatic line number generation for use when creating programs or inserting sequencial lines between existing lines. You can set the printer baud rate and direct normal or compiled listings to the printer for hard copy. The built-in editor makes program corrections and changes as easy as "falling off a log". If CBASIC finds an error when compiling, it points to the place in the program line where the error occurred. All you have to do is tell the editor what line you want to start editing and when it is displayed, move the cursor with the arrow keys to the place where the error is and correct it. Just like that, it's simple.

HI-RES & 80 COLUMN DISPLAYS

CBASIC is the only Color Basic Compiler that includes its own Hi-Resolution 51, 64 or 85 by 24 line display. It is also the only compiler that supports both the PBJ "Word-Pak" and the Double Density 80 column cards. All of these display formats are part of the standard CBASIC compiler package. Not only can these display formats be used for normal program editing and compiling, but CBASIC will also include them in your compiled programs! If you want CBASIC to include the display driver in your program, all you have to do is use a single CBASIC command "HIRES". The run-time display driver that CBASIC includes in your program is not just a simple display, but a full-featured display package. With the Hi-Resolution display package you can mix text & graphics, change characters per line, underline, character highlight, erase to end of line or screen, home cursor, home & clear screen, protect screen lines, and much more. All commands are compatible with our HI-RES II Screen Commander so you can easily develop screen layouts using HI-RES and Color Basic before you compile your program. The same applies to using the 80 column card drivers. What other Basic compiler offers you this kind of flexibility?

64K RAM SUPPORT

CBASIC makes full use of the power and flexibility of the 6883 SAM (Synchronous Address Multiplexer) in the Color Computer. It will fully utilize the 96K of address space available in the Color Computer (64K installed) during program Creation, Editing and Compilation. CBASIC has a special command for automatic 64K RAM control. When used in a program, it allows the user to use the upper 32K of RAM space automatically for variables or even program storage at run-time. It will automatically switch the ROMs in and out when needed. There are also two other commands that allow you to control the upper 32K of RAM manually, under program control. No other Color Basic compiler directly supports the use of 64K RAM like CBASIC.

ALL MACHINE LANGUAGE

CBASIC is completely written in fast efficient Machine Language, not Basic, like some other Color Basic compilers. Because of this, CBASIC can edit and compile very large programs. Even using the Hi-Resolution 51 by 24 line display, it can work with about a 34K program, and the 80 column card versions can handle almost 40K of program. Some of the other Basic compilers can only work with 16K or about 200 lines. Even working with large programs, CBASIC compiles programs with lightning fast speed. It will compile a 24K program to disk in less than 2 minutes! That's without a listing being generated. We've heard stories about some other compilers that take almost 10 minutes to compile a simple 2-3K program. You might inquire about this when you look at some of the other compilers available.

THE FINISHED PRODUCT

Since CBASIC contains statements to support ALL of the I/O devices (Disk, Tape, Screen & Printer), Hi-Res Graphics, Sound, and Enhanced Screen displays, it is well suited for a wide range of programming applications. It generates a complete, Ready to Run machine language program. The finished product or program does not have to be interfaced to a Basic program to perform some of its functions or commands. This may seem obvious to you, but some of the other Color Basic compilers don't necessarily work this way. Some of their compiler commands need a separate Basic program in order for them to work. In some cases, require that a separate Basic program be interfaced to the compiled program to perform I/O functions, like INPUT, PRINT and so on. CBASIC doesn't do this. ALL of its commands are compiled into a single machine language program that does not require any kind of Basic program to make it work.

COMPATIBILITY

You may be wondering about those statements we made earlier concerning 99% or 99.9% syntax compatibility. What does that other 1% consist of? The biggest part of that 1% has to do with string arrays and variables. CBASIC does not use a "String Pool" like Color Basic. It uses absolute memory addresses to locate string variables and arrays. This is why CBASIC's string processing is so fast, it also eliminates the time consuming "Garbage Collection" problem. When CBASIC allocates space for strings, it must know how much space to use for each string. When you Dimension a string variable in CBASIC, you must tell it how much space you want to save for each element. To Dimension an array of 40 strings, 64 characters each, you would DIM DA$(40,64). If a string is not dimensioned, CBASIC will automatically allocate 32 bytes for it. If you want a single string to have enough room for 200 characters you would DIM AX$(200). For string arrays, you would still access the element you want, the same as Color Basic, to get string #30 from the array DA$, you would still use DA$(30), the only real change is in the DIM statement. For undeclared string arrays of 10 elements or less, CBASIC will automatically reserve space for 10 (0-9) strings of 32 characters. In some other Color Basic compilers, you have to declare EVERY string variable used in the progrm in a DIM statement. And, to create an array of 40 strings with 64 characters each, you would have to DIM AD$(2560), and then to access string #30, you would have to multiply 30 × 64 and use a special variable name format or access it one character at a time. Not very compatible or convenient to use, and difficult at best.

CBASIC REQUIREMENTS

CBASIC requires a minimum of 32K RAM and at least one Disk drive. We strongly recommend that you have 64K. CBASIC is compatible with all versions of Color & Extended Basic and both Disk Basic V1.0 and V1.1. Programs compiled on either system will run on systems with different ROMs. CBASIC is NOT compatible with JDOS.

DOCUMENTATION

The Documentation provided with any program is very important to the user. This is especially true when you talk about a program as complete and complex as CBASIC. Even though CBASIC was designed to be the most User Friendly compiler on the market, we went to great lengths to provide a manual that is not only easy to use and understand, but comprehensive and complete enough for even the most sophisticated user. The manual included with CBASIC consists of approximately 120 pages of real information, not like some manuals that put just one or two short paragraphs on a page. If we did it that way, we could have easily created a three or four hundred page manual. The manual index breaks down each section of the manual and gives a 3 or 4 word description of each section and its items along with page numbers. The manual has three sections, the Editor, Compiler and Appendix. Each of these is divided into subsections, with Section and Subsection titles printed at the top of each page. If you want to, you could find the information you are looking for by simply flipping through the pages and scanning the Section titles on the top of the pages. The Manual itself is an 8½ by 11 Spiral Bound book with durable leather textured covers. Some of the reports we have had from CBASIC users describe the manual as being the Best program manual they have ever used.

COMPARE THE DIFFERENCE

CBASIC is not just another Color Basic Compiler. It is the only complete Basic Compiler System for the Color Computer. Compare CBASIC's features to what other compilers offer and you'll see the difference. When comparing CBASIC to other compilers, you might want to keep some of these questions in mind. Does it support I/O functions? You can't write much of a program without PRINT, INPUT and so on. What about complex string statements, or string statements at all? How large of a program can you write? Can you compile a complex string like: MID$(RIGHT$(DA$(VAL(IN$),LEN(LE$)),3,3)? Can you use two character variable names for string & numeric variables, like Basic. Does it support all the Hi-Res graphics statements including PLAY, DRAW, GET and PUT, using the same syntax as Basic? Do you ever have to use a separate Basic program? Can you take complete Basic programs and compile them without extensive changes? Will they work? How do you edit a program when it has errors compiling?

PRICE VERSUS PERFORMANCE

The price of CBASIC is $149.00. It is the most expensive Color Basic Compiler on the market, and well worth the investment. We spent over 2 years writing and refining CBASIC, to make it the Best, most Compatible Color Basic compiler available. Most of our CBASIC users already bought one or more of the other compilers on the market and have since discarded them. We even traded in a few of them. If you want a cheap compiler, we'll sell you one of those traded in, at a good price. Before you buy a compiler, compare the performance of CBASIC against any Color Basic compiler. Dollar for Dollar, CBASIC gives you more than any other Color Basic compiler available.

ORDERING INFORMATION

To order CBASIC by mail, send check or money order in the amount of $149.00 plus $3.00 for shipping and handling to the address listed below.

To order by VISA, MASTERCARD or COD, call us at: (702) 452-0632 (Monday thru Saturday, 8am to 5pm PST).

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- Save and Load Text Buffer and Program Key Buffers to Tape or Disk
- 9 Hi-Resolution Display Formats, 28 to 255 x 24
- True Upper/lower Case Display
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- Supports Line Break
- Freeze Display and Review Information On Line
- Send Files Directly from Buffer or Disk
- Full Disk Support for Disk Version
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- Separate Printer Baud Rates 110-9600
- Display on Screen or Output Contents of Buffer to Printer
- Automatic Memory Sense 16-64K
- 9 Programmable Function Key Variable Length Macro Buffer
- Programmable Prompt Character or Delay to Send Next Line
- Programmable Control Character Trapping
- Programmable Open/Close Buffer Characters
- Automatic Key Repeat For Editing
- Program and Memory Status Displays

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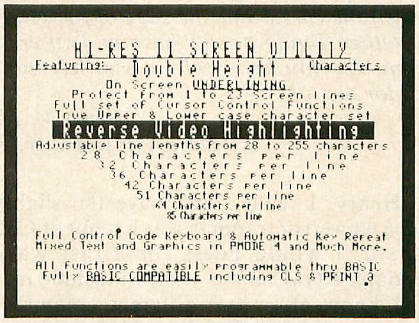

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Screen Enhancement Program Comparison Chart

PROGRAM FEATURES	HI-RES II NEW	HI-RES I OLD	BRAND X
Upper/Lower case characters	Yes	Yes	Yes
Mixed Text and Graphics	Yes	Yes	Yes
Separate Text & Graphics	Yes	Yes	No
Print @ fully implemented	Yes	Yes	Yes
Print @ on all line lengths	Yes	Yes	51 only
Different line lengths	28 to 255 (9)	28 to 255 (9)	51 only (1)
Automatic Key Repeat	Yes	Yes	Yes
Adjustable Key Repeat	Yes	No	No
Auto Repeat Disable	Yes	No	No
Erase to end of line/screen	Yes	Yes	Yes
Home Cursor	Yes	Yes	Yes
Solid or Blinking Cursor	Yes	No	Yes
CLS command supported	Buff/Biack	Buff/Black	Buff/Black
X,Y Coordinate Cursor Positioning	Yes	Yes	No
Double Size Characters	Yes	Yes	No
Individual/Continuous Highlighting	Yes	Yes	No
On Screen Underlining	Yes	Yes	No
Clear Key functional	Clear/L keys	Clear key	No
16.32 & 64K Supported	Yes	Yes	Yes
Green or Black Background Color	Yes	No	No
Dual Character sets for Enhanced 64 and 85 Characters per line display	Yes	No	No
Protected Screen Lines (programmable)	1 to 23	No	No
Full Control Code Keyboard for Screen control directly from the keyboard	Yes	No	No
Programmable Tab Character Spacing	Yes	No	No
Full Screen Reverse Function	Yes	Yes	No
Switch to & from the Standard 16 by 32 Screen for full compatability	Yes	No	No
On Error Goto Function	No	No	Yes
Extended Basic Required	No	Yes	Yes
All Machine Language Program	Yes	Yes	Yes
RAM Required in addition to Screen RAM	2K	2K	2K
Program Price (Tape)	$24.95	$19.95	$29.95

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RAINBOWTECH

DOWNLOADS

Communication Breakdown

By Dan Downard
Rainbow Technical Editor

• *The columns by both Lawrence Falk and James Reed, together with the two-page ad (pages 26 and 27) in the November 1985 issue of RAINBOW did it to me . . . I rushed out and bought the R/S DCM-3 Modem, a four-pin connection cable, a phone line adaptor, and proceeded to hook everything up, as per instructions.*

I plugged the DCM-3 into the serial I/O port on my Color Computer, made sure every other connection was correct, and then (following instructions in both the DCM-3 manual and the directions on Page 27 of the ad) I breathlessly dialed the local Tymnet number, got the carrier, tapped the connect bar and hung up. The Carrier Detect Indicator lit up to indicate that I indeed had the signal and I waited for "the message." Now, I know you're not going to believe this, but nothing happened!

What gives? Where have I gone wrong? The ad more or less assumes that I am fully knowledgeable about modems, and further, that I have the capability of changing such variables as the Baud rate, the word length, parity (whatever that means) and the number of stop bits. Who does, and how?

J.C. Woodson
Burlingame, CA

Boy, James, it sounds like you have trouble. Since I usually use Uninet, I tried using Tymnet just to see if it worked. It worked just like the instructions in the November RAINBOW.

Just for your information, I was using 300 Baud, seven bits and no parity. According to the Delphi manual, your terminal should be set for eight-bit ASCII and one stop bit. The manual also states that you may have to experiment. I haven't figured that statement out yet.

The reason the instructions mentioned that you may receive a garbled message prompt is because the Tymnet introduction is sent at 300 Baud. Tymnet will not sense that you are sending at 1200 Baud until you do something. You did not mention the use of an RS-232 pack, so I assume you are using 300 Baud, also.

I have two suggestions: Try contacting Tymnet to see if there's some kind of problem in your area, or try using Uninet.

Dan Downard is an electrical engineer and has been involved in electronics for 25 years through ham radio (K4KWT). His interest in computers began about six years ago and he has built several 68XX systems.

Error Trapping

• *I have a CoCo 2 and generally run on Color Disk BASIC, although I also have OS-9 and BASIC09.*

I have some programs I am trying to develop and desperately need an error trap of some sort. "On error" doesn't exist for these systems, and I am wondering if there is some way a routine could be written to recognize any of the error messages that come up, specifically the one that comes up when the cursor hits the edge of the screen.

Other Tandy BASICs have an "on error" trap. Do you know why it was left out of Color BASIC?

Henry V. Leih
Black Canyon City, AZ

Henry, I really don't have the slightest idea why error trapping was left out of Color BASIC. I would guess there just wasn't enough ROM memory left to include it.

I know of several different commercial programs that offer the addition of error trapping, such as *JDOS*, *SuperScreen* by Mark Data Products and *64K Screen Expander* by Computerware. You mention that you have BASIC09. It also has error trapping.

I don't think an error will be generated in Color BASIC when the cursor hits the edge of the screen. The only suggestion is to `PEEK(&H88)`. This will give you the current address of the cursor. From there, you are on your own.

Another suggestion is to experiment with RAM hooks at $018E and $0191. These vectors were reserved for error trapping by Microsoft.

Getting BASIC09 Loaded

• *I have purchased a great amount of hardware and software after reading articles and advertisements in your magazine, especially "KISSable OS-9" and ads for Color Computer products. I bought a 64K Color Computer, one disk drive, OS-9, BASIC09 and* The Complete Rainbow Guide to OS-9.

The problem is that I can't seem to find the proper instruction for loading BASIC09. Page 2-2 of the BASIC09 Reference Manual says after the OS9: prompt enter BASIC09 and you get the prompt 'B'. All I get when I do this is Error #215.

I took the BASIC09 back to Radio Shack and they replaced it as defective, but the new one does the same thing. After staying up all night for three nights studying The Rainbow Guide *(which doesn't show how to load BASIC09) and the OS-9 manuals, I am still lost.*

Could you please give these instructions or explain the cause of the problem I'm having? I have been programming for about four years in BASIC and assembly language and use five computers, including an IBM 370.

Ray Pitts
Experiment, GA

Ray, according to my OS-9 documentation, Error #215 is "bad pathname." Most of the time I think you will get Error #216, or "pathname not found." The problem you are having is due to the fact that you must have BASIC09 in your current execution directory. There are two ways to accomplish this.

The first is to copy BASIC09 from your BASIC09 master disk to your OS-9 system disk. Assuming you have two drives, the procedure would be as follows:

1) Boot OS-9. Leave the system disk (preferably a backup) in Drive 0.

2) Insert your BASIC09 disk in Drive 1.

3) Type: `COPY /D1/BASIC09 /D0/CMDS/BASIC09`

4) Remove the BASIC09 disk from Drive 1.

5) Type: `BASIC09`

The easier way to accomplish the same result is to change your execution directory to Drive 1, where the BASIC09 program resides. You do this by typing `CHX /D1`.

If you have only one drive, you can only use the first method. After `COPY` in the command line, insert a "-S" to make it a single-drive copy.

I suggest reading your OS-9 manuals to become familiar with the two different directories (data/working and execution) used by OS-9 to further clarify this problem.

Fickle Files

- *I have a 64K CoCo revised 'D' board, one disk, standard BASIC 1.1, Extended BASIC 1.0 and Disk BASIC 1.0.*

My question concerns the `FILES` *command. The manual states that you can increase the disk buffer size with a command such as* `FILES 1,1000`. *However, even after issuing this command, data is still written to the disk as soon as 256 bytes accumulate in the buffer. Can you explain how to increase the size of the disk buffer so data is written to the disk less often?*

Tom Veik
Columbus, NE

Tom, the disk structures of Disk BASIC and OS-9 call for disks to be formatted with a sector length of 256 bytes. Data will always be written in groups of 256 bytes, whether you are writing one or 1,000 bytes.

Why use the `FILES` command? When dealing with random files, if a record is longer than 256 bytes, you have to reserve buffer space for the number of bytes in the record. Otherwise, the default value of 256 is used.

Jimmying the Joystick Plots

- *Is there any way to get better plots on my joystick than 0-60 horizontally and 0-60 vertically? Perhaps 0-255 horizontally and vertically?*

Brandon Rhodes
Andover, MA

The limiting factor for joystick resolution is the analog-to-digital converter inside your CoCo, Brandon. Only a six-bit A-to-D converter is used.

If you wish to experiment with 256 by 256 joystick resolution, try *CoCo Max* by Colorware. An eight-bit A-to-D converter is in the "black box" that comes with the software. Adequate instructions are given in the manual for using it for custom applications.

Keyboard Replacement

- *I recently purchased a replacement keyboard for my CoCo. It's available at many Radio Shack stores for $4.95 under part number 277-1019. While the keyboard is not described as a CoCo part, it fits perfectly on my CoCo 2 and all the standard keys work as before. However, the keyboard routines in the ROM do not correctly produce the codes for Control and Alt, the two function keys. This problem is a software problem and does not particularly concern me. What I would like to do is use this keyboard on an older CoCo that has a different ribbon connector. Where may I obtain an adapter that allows this keyboard to be used with older CoCos?*

Tim Keith
Seguin, TX

An adapter is available for connecting the ribbon cable to the older type of pin connectors. I bought mine from Spectrum Projects. Unfortunately, I don't know the part number, but maybe some of our readers will help.

Looking for a Driver Program for TTY Terminals

- *I have noticed from several articles in your "Downloads" section that you seem to have some experience with interfacing CoCo and TTY. We are starting a club project to set up a BBS for people in our area using TTY (teletypewriter) terminals for the deaf. Some are ASCII compatible, but most are not. We currently run a modified Rainboard using a version of your remote terminal driver program from the November 1983 RAINBOW. We are looking for a similar program that would be compatible with the five-bit Baudot protocol used by telecommunications devices for the deaf. We have the TDD-43 program from CompuServe, but it will not work for our purposes as it uses the cassette port instead of the serial port for I/O. Do you know of any driver program we can use, or have suggestions for modifying your driver program?*

Mac Knight
Yakima, WA

One of the first articles I did for THE RAINBOW was using nonstandard software and hardware with the CoCo. If you can find a copy, look for February 1983. In this article is a machine language driver for using a Baudot printer with your CoCo. It is not exactly what you are looking for, but it will head you in the right direction as far as writing a program using "look-up tables."

If enough people write, we'll rewrite *Remote* for Baudot use. With the number of Model 28 and 32 ASCII machines available, I didn't think anyone was using Baudot anymore.

More on OS-9 Uploading from the M100

- *I am writing in response to a letter in the January 1986 "Downloads" from Allan Wysocki. He, like myself, has found he can download files from his CoCo running OS-9 to his Model 100, but has trouble uploading from the Model 100 to the CoCo. The problem is the 100 sends the file until it receives an XOFF, so what is needed is a device driver that supports XON/XOFF. T1 does not, as far as I know. Several of the T2 drivers, including the Tandy T2, do support XON/XOFF. I have found that using any of these I can download at any Baud rate, including 19200, however, the best I have been able to do on an upload is 300 Baud. This is the setup I have found to work best. First, I use the Tandy T2 set at 300 Baud, the 100 hooked to T2 with an RS-232 cable and null modem. I use* TSMON *and logon to the CoCo with the 100's Telcom set to 38N1E.*

I'm ready to upload, but here we run into another problem. "Build" does not seem to work with this setup. What I use is a program written by Bill Brady called XUPL *that can be found on CompuServe's OS-9 SIG. I type* `XUPL FILENAME` *on the 100.* XUPL *opens a file and responds by telling you that it is ready and to press* ESC *when done. Now you can upload most files by hitting function key '3' on the 100. If you get errors, such as #244 or #216, then use XMODE/T2-ECHO and set the 100 to half duplex and try your upload again.*

The reason for this problem appears to be that after the CoCo sends an XOFF, the 100 may still send some characters before it can react to the XOFF. These characters cause an Error #244 (keyboard buffer overflow) and then maybe some #216s (pathname not found). If you are using one of the other T2 drivers that support XON, these extra characters are lost but the upload will not abort on errors. What we really need is for someone to write a new driver that continues to accept the incoming characters until the 100 stops sending. The Tandy T2 seems to do this, but must not have a big enough buffer.

Wayne Miller
Westminster, CA

Where there's a will, there's a way, Wayne. Thanks for your help.

Your technical questions are welcomed. Please address them to: Downloads, THE RAINBOW, P.O. Box 385, Prospect, KY 40059. We reserve the right to publish only questions of general interest and to edit for space and clarity. Due to the large volume of mail we receive, we are unable to answer letters individually.

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LEARNING OS-9

How to deal with errors, their message types and the conditions under which they occur

The Utility Room

By Brian A. Lantz

Welcome back to "The Utility Room." In your home, a utility room is usually used to store and keep a variety of things. It is the place where just about anything at all can be found! That is what makes this article different. Along with learning additional programming skills, I hope you find a different, creative point of view. As a programmer, your most valuable resource tool is your imagination. Coding a program is not difficult, but creating the idea that later becomes the program is the most difficult phase of programming. Therefore, some of the content of these articles leans to the abstract. I hope these thoughts and ideas will develop into different and exciting ideas for OS-9.

This month, we'll deal mainly with errors, error messages and error conditions. We will first classify these, then look at the differences between types of errors and their messages.

Your Enemy: The Error

Here is a proverb for all of you philosophers — "An enemy is usually someone that you don't know well enough to consider a friend." This is the type of enemy the standard error is. All you need to do to make it your friend is get to know it. Anticipate its every move. Take advantage of its weaknesses and be cautious of its strengths. When you start doing this, you will be in control of the error.

Types of Error Messages

There are five basic types of error messages. I will refer to these as the "five S's": silent errors, slovenly errors, sober errors, smart errors and social errors. Let's look at each of these types of error messages.

1) Silent — This is the "no message" error message. For example, you've spent the last six hours working on a program. You do not have a backup copy of your work. You go to exit your text editor and suddenly the system crashes for no apparent reason. Whether you know it or not, you just received an error message.

2) Slovenly — This is a vague and non-specific error message. Receiving this kind of message is better than getting a "no message" message, but it doesn't tell you a whole lot. A typical example of this is an I/O Error message. This could be one of several dozen actual error conditions.

3) Sober — This is a message that is specific, but does not give you much information by itself. The OS-9 F$PERR (PRINT ERROR) routine is like this. It tells you exactly which error occurred, but most of us need to pick up our manuals to find out what this really means. This kind of error message is usually the most specific and the least friendly.

4) Smart — This is a message that is specific, but still a little vague. An example of this is a "can't open input file" message. This is specific as it relates to the problem, but it is vague in its explanation of the cause.

5) Social — This is the user-friendly type of error message. It is both specific and informational. It tells what kind of error occurred and gives you enough information to figure out the solution. It may or may not give as specific an explanation of the cause as the sober message does. The key feature of this message is that you are given the full "picture" at the time of the error. To convert the smart example to a social one, you would receive either "input file doesn't exist" or "you have no permission to use input file."

Which one is the best of the five S's and which one should be used in your programs? Well, the answer is all of them! You will probably use each one at one time or another. As a general rule, though, we will try to use the smart and social messages whenever possible. That doesn't mean exclusively, just preferably.

Types of Errors

There are really only two types of errors, fatal and

Brian Lantz lives in Tampa, Florida, and is president of the national OS-9 Users Group. He is a free-lance programmer, with programs carried by Tandy, Computerware and Frank Hogg Laboratories. He has developed much of the commercial OS-9 software released in the last year.

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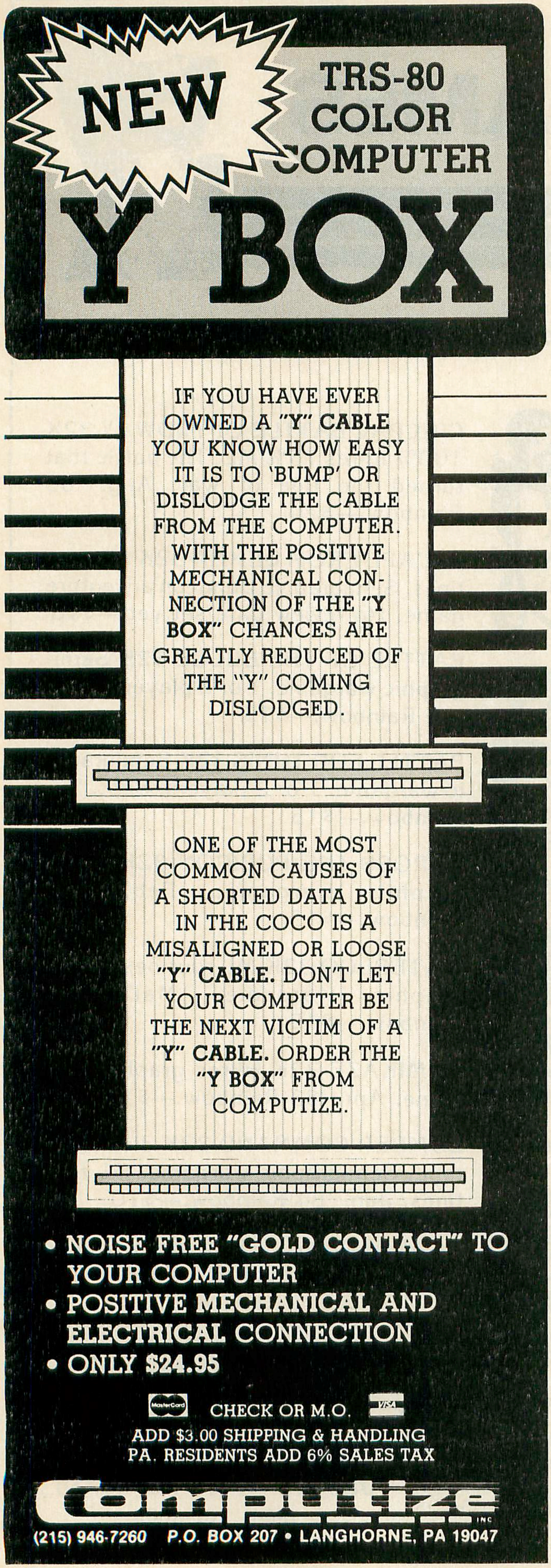

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nonfatal. A fatal error is any condition that prevents the program from continuing in its normal operation. These can range from errors that cause a system "crash" to ones that occur because other programs, or files, that are needed cannot be found or loaded. A nonfatal error is one that can be "worked around," that is, an error with which you can simply print out a message and resume operation.

There are some occasions where, due to the way a program is written, an error is treated as a fatal one when it could have just as easily been regarded as nonfatal. A familiar example is if you give the LIST command (or our CAT command) three files to print and the second one does not exist, then a fatal error occurs and the third file does not get printed. This could have been programmed to print out an error message and continue on to the next file, but the original programmer made this a fatal error instead of a nonfatal one.

Types of Error Conditions

Here's where OS-9 becomes your ally in the fight against the dreaded error. OS-9 system calls usually do all the work of determining an error. With most of the system calls, the carry bit of the Condition Code register tells you if an error occurred. If the carry is set, then an error occurred and the error number is usually contained in Register B. If the carry is clear, then OS-9 did not detect an error.

True, most I/O errors and fatal system errors are easily detected by the system calls without a lot of additional programming on your part, but that doesn't mean you can relax in your dealings with errors. It simply reduces the number of errors to which you need to give your attention. If you wish to be a good programmer, you must think through every possible error that can happen, whether it can occur because of improper operator input or hardware limitations.

Error or Bug?

Let's clarify one other thing before we start our coding. A bug is not an error and an error is not a bug. An error is a condition that can occur outside of the program's control. A bug is an oversight on the part of the programmer.

Though bugs and errors are separate, they do sometimes relate closely. Some errors can lead to the discovery of otherwise hidden bugs. As an example, I know of a word processor for the CoCo that is flawless in every way, except for one. If, in the course of use, the word processor fills a disk in the midst of saving text, the program goes totally nuts. This error (disk full) was not handled properly by the programmer, thus, a bug is born. However, this bug will never occur unless it is assisted by an unbridled error.

End of the Cat Nap

Now for some serious coding. If you examine Listing 1, you will see that it is essentially the same listing as in December's issue, with several additions. One change is that the line numbers (which are only for reference) are now enclosed in parentheses. Remember, if you are entering this program (CAT), do not put in these line numbers.

The first addition in this month's listing is at lines 236 and 237. This is a new error message. Its use will be explained in a moment. A minor change has been made on Line 450. A label (CAT42) has been added. There are two additional lines at 451 and 452. I had left in a deliberate bug, and no one caught it! These lines correct this bug. Let's see if you can figure out what that bug was.

Separate the Files

A "clean-up" has been added in lines 480-487. Line 480 has been changed to branch if all is done to label OUT. Lines 481-487 are listed here:

```
PSHS      X           save parameter pointer
LEAX      ERROR,PCR   point to a line feed character
LDA       #STDOUT     this is going to standard output path
LDY       #1          only one character to output
OS9       I$WRITLN    print it! (separates files)
PULS      X           restore parameter pointer
BRA       BEGIN       go back & LIST another file
```

First, the parameter pointer in Register X is saved, then 'X' is pointed to a line feed character, like the first character of the error message. This character is output. A line feed was chosen instead of a carriage return to make this work easier with other utility programs, such as a word count utility that counts all carriage returns as separate lines.

And on the Subject of Errors

The biggest section of code added was to change an error condition from fatal to nonfatal. This change was made to the "open file" routine. Now if a file cannot be opened, the error message "cat: can't open filename" is displayed and the next file is processed. Previously, this error would return to OS-9 with the error number and the additional files would not be viewed. Lines 280 and 290 were changed and 22 lines were added between them.

The first section (shown here):

```
CMPB      #216        "FILE NOT FOUND" error ??
LBNE      EXIT        no, exit program (troubles)!
```

checks to see if it was a "file not found" error. If it wasn't, then it is treated as a fatal error since something must be wrong with the disk itself.

The second section of this additional code:

```
        LDX       PRMPTR      else, point to the filename
        LEAY      BUFFER,U    and the buffer
CAT3    LDA       ,X+         get a character from the name
```

```
        STA       ,Y+         and place it in the buffer
        CMPA      #$0D        end of the command line??
        BEQ       CAT4        yes, all done w/the name
        CMPA      #$20        else, end of the filename??
        BNE       CAT3        no, loop back till name done!
        LDA       #$0D        else, get a <CR>
        STA       0,Y         and place it at the end of the name
```

copies the filename that couldn't be found into the buffer and makes sure it is terminated with a carriage return.

Next, the parameter pointer is adjusted and saved:

```
CAT4    LEAX      -1,X        back up the parameter pointer
        STX       PRMPTR      and store the new value
```

Lastly, the "cat: can't open" portion of the message is printed, followed by the printing of the filename that was copied into the buffer:

```
LEAX      ACCESS,PCR point to the access error msg
LDY       #17         it is 17 characters long
LDA       #2          output to standard error path
OS9       I$WRITLN    and write the 1st part of msg
LEAX      BUFFER,U    now point to the copied name
LDY       #BUFSIZ     set length to maximum
OS9       I$WRITLN    and write out the filename, also
BRA       CAT42       go back for another file
```

And Now, a Gold Star for the Class!

As an added bonus, I present Listing 2. This is the error utility command from the *Unicharger* utility package, distributed by Frank Hogg Labs, which is appropriate since we have been talking about errors. This is a very simple program that takes a decimal error number and prints the description from the *ERRMSG* file. It assumes this file is located in the /D0/SYS directory. If you have this in another directory, simply change the string at the label ERFILE to reflect the position of the *ERRMSG* file in your system.

This listing is supplied for personal use only. I hope you can get use out of it.

A Look at the Mail Bag

Several good ideas have come in the mail recently. If you have an idea for a good utility command that we can tackle, drop me a line. Also, if you have problems understanding certain items within the OS-9 environment, let me know; I'll try to explain them further. ☐

Editor's Note: Although OS-9 programs are not included on RAINBOW ON TAPE, the following program listings are now available for downloading from our new Delphi CoCo SIG (there is a $3.50 per program surcharge). From the CoCo SIG> prompt, pick DATABASE and then, RAINBOW ON TAPE to access these programs.

Listing 1:

```
(1)     ***********************************************************
(2)     *            CAT Utility Command version 2                *
(3)     *                                                         *
(4)     * syntax:  cat [+num1][-][num2][filename]{....}           *
(5)     *                                                         *
(6)     *            Copyright 1985 Brian A. Lantz                *
(7)     *                 All rights reserved                     *
(8)     *                                                         *
(9)     * Copies input from specified file(s) (or standard        *
(10)    * input) to standard output.                              *
(11)    ***********************************************************
(20)
(30)              NAM CAT
(40)              IFP1
(50)              USE /D0/DEFS/OS9DEFS
```

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```
(60)                   ENDC
(70)     TYPE          SET         PRGRM+OBJCT
(80)     REVS          SET         REENT+1
(90)                   MOD         THEEND,CATNAM,TYPE,REVS,BEGIN,CATMEM
(100)    CATNAM        FCS         "Cat"
(110)                  *
(120)    BUFSIZ        EQU         200
(125)    MULT          EQU         10
(130)                  ORG         0
(140)                  * this is the beginning of the data area.
(150)    IPATH         RMB         1           this is the input path #
(155)    COUNT         RMB         2           line counter
(156)    FROM          RMB         2           to store "line1"
(157)    TO            RMB         2           to store "line2"
(160)    PRMPTR        RMB         2           this is the parameter pointer
(170)    BUFFER        RMB         BUFSIZ      this is the input buffer
(180)                  RMB         200         this is the stack's memory
(190)                  RMB         200         the parameter area is here
(200)    CATMEM        EQU         .           this ends the data area
(210)                  *
(220)                  * The following line sets the EDITION number to 2
(230)    VRSION        FCB         2
(231)    ERROR         FCB         $0A
(232)                  FCC         /cat: parameter error/
(234)                  FCB         $0D
(235)                  *
(236)    ACCESS        FCB         $0A
(237)                  FCC         /cat: can't open /
(240)                  *
(250)    BEGIN         STX         PRMPTR      save your parameter position
(251)                  CLRA                    set register A equal to 0
(252)                  CLRB                    set register B equal to 0
(253)                  STD         COUNT       store 0 at COUNT
(253.1)                STD         FROM        clear FROM pointer
(253.2)                SUBD        #1          make D equal 65535
(253.3)                STD         TO          set TO pointer
(253.4)                BSR         OPTCHK      process options
(254)                  STX         PRMPTR      store X at PRMPTR
(255)                  CLR         IPATH       default input from stdin
(256)                  LDA         0,X         place character at X in A
(257)                  CMPA        #$0D        is the character a <CR> ??
(258)                  BEQ         MAIN        if so, skip to MAIN
(260)                  LDA         #READ.      set access mode for reading
(270)                  OS9         I$OPEN      attempt to open file
(280)                  BCC         CAT5        file opened okay!
(280.1)                CMPB        #216        "FILE NOT FOUND" error ??
(280.2)                LBNE        EXIT        no, exit program (troubles)!
(280.3)                LDX         PRMPTR      else, point to the filename
(280.4)                LEAY        BUFFER,U    and the buffer
(280.5)CAT3            LDA         ,X+         get a character from the name
(280.6)                STA         ,Y+         and place it in the buffer
(280.7)                CMPA        #$0D        end of the command line??
(280.8)                BEQ         CAT4        yes, all done w/the name
(280.9)                CMPA        #$20        else, end of the filename??
(281)                  BNE         CAT3        no, loop back till name done!
(281.1)                LDA         #$0D        else, get a <CR>
(281.2)                STA         0,Y         and place it at the end of the name
(281.3)CAT4            LEAX        -1,X        back up the parameter pointer
(281.4)                STX         PRMPTR      and store the new value
(281.5)                LEAX        ACCESS,PCR point to the access error msg
(281.6)                LDY         #17         it is 17 characters long
(281.7)                LDA         #2          output to standard error path
(281.8)                OS9         I$WRITLN    and write the 1st part of msg
(281.9)                LEAX        BUFFER,U    now point to the copied name
(282)                  LDY         #BUFSIZ     set length to maximum
(282.1)                OS9         I$WRITLN    and write out the filename, also
(282.2)                BRA         CAT42       go back for another file
(282.3)
(290)    CAT5          STA         IPATH       store input path #
(300)                  STX         PRMPTR      store parameter position
(305)                  * this is the main loop
(310)    MAIN          LDA         IPATH       get input path #
(320)                  LEAX        BUFFER,U    set 'X' point to the buffer
(330)                  LDY         #BUFSIZ     set 'Y' to maximum # of bytes
(340)                  OS9         I$READLN    attempt to read a line
(350)                  BCS         EOFCHK      branch out if error or EOF
(351)                  LDD         COUNT       get the current line count
(352)                  ADDD        #1          add 1 to the line count
(353)                  STD         COUNT       store the new line count
(354)                  CMPD        FROM        compare COUNT to FROM
```

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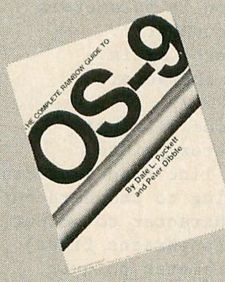
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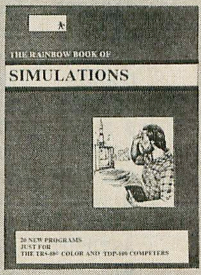
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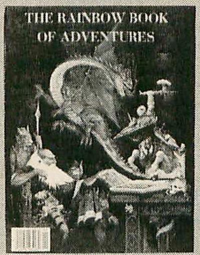

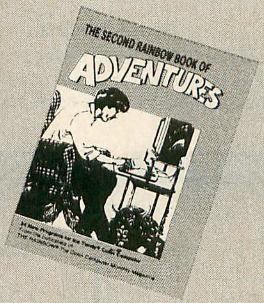

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```
          BLO     MAIN         if less than, loop
          CMPD    TO           compare COUNT to TO
          BHI     EOF          if high, end file
          LDA     #1           load 'A' with standard output
          OS9     I$WRITLN     write to standard output
          BCC     MAIN         if no error, loop back
          BRA     EXIT         otherwise, end program
          * check for End Of File
EOFCHK    CMPB    #E$EOF       is it the EOF ??
          BNE     EXIT         if not, error has occurred
EOF       LDA     IPATH        get input path #
          OS9     I$CLOSE      and close the path
          BCS     EXIT         if an error, branch
CAT42     LDX     PRMPTR       get position in parameters
          CLR     COUNT        make line counter...
          CLR     COUNT+1      equal to zero, again.
          LDA     0,X          check next character
          CMPA    #$0D         is it a <CR> ??
          BEQ     OUT          yes, all done listing!
          PSHS    X            save parameter pointer
          LEAX    ERROR,PCR    point to a line feed character
          LDA     #STDOUT      this is going to standard output path
          LDY     #1           only one character to output
          OS9     I$WRITLN     print it! (separates files)
          PULS    X            restore parameter pointer
          BRA     BEGIN        go back & LIST another file

OUT       CLRB                 clear 'B' and 'CC'
EXIT      OS9     F$EXIT       exit the command
          *
OPTCHK    LDA     ,X+          get next character
          CMPA    #',          check for a comma
          BEQ     OPTCHK       if it is, skip it
          CMPA    #$20         check for a space
          BEQ     OPTCHK       if it is, skip it
          CMPA    #'+          check for a "+"
          BEQ     PLUS         if it is, branch
          CMPA    #'-          check for a "-"
          BNE     OPTOUT       if not, end OPTCHK
          *
MINUS     LDA     0,X          get next character
          CMPA    #'0          test low number range
          BLO     OPTCHK       if less, branch
          CMPA    #'9          test high number range
          BHI     PARERR       if too high, error
          BSR     GETNUM       convert the number
          STD     TO           store "line2" at TO
          LDA     0,X          get next character
          CMPA    #$20         is it a space?
          BEQ     OPTCHK       if so, branch back
          CMPA    #',          is it a comma ??
          BEQ     OPTCHK       if so, branch back
          CMPA    #$0D         is it the end of line?
          BEQ     OPTCHK       if so, branch back
          BRA     PARERR       else, a parameter error
          *
PLUS      BSR     GETNUM       convert the number
          STD     FROM         store "line1" at FROM
          LDA     0,X          get next character
          CMPA    #'-          is it a "-"?
          BEQ     OPTCHK       if so, branch back
          CMPA    #',          is it a delimiter?
          BHI     PARERR       if not, parameter error
          LDD     FROM         get "line1"'s value
          STD     TO           store as "line2"
          BRA     OPTCHK       branch back
          *
OPTOUT    LEAX    -1,X         set X back one char.
          RTS                  return from routine
          *
PARERR    LEAX    ERROR,PCR    get the error message
          LDY     #BUFSIZ      set up a big enough buffer
          LDA     #2           standard error path
          OS9     I$WRITLN     write error message
          BRA     OUT          end LIST command
          *
GETNUM    CLRA                 set A equal to 0
          CLRB                 set B equal to 0
          BSR     ONCE         check for 1 digit
          BSR     TWICE        check for 2 digits
```

```
TWICE    BSR     ONCE       check for 1 digit
ONCE     BRA     DIGIT      check for 1 digit
         *
DIGIT    PSHS    D          save D on the stack
         LDB     0,X        get next character
         SUBB    #'0        subtract value of "0"
         BCS     DIGOUT     if less than "0" branch
         CMPB    #MULT-1    is it a digit ??
         BHI     DIGOUT     if not, branch
         PSHS    B          save number
         LDB     #10        ready to multiply by 10
         MUL                multiply previous MSB
         STB     1,S        save result
         LDA     2,S        get previous LSB
         LDB     #10        get ready to multiply
         MUL                multiply by 10
         ADDB    ,S+        add current digit
         ADCA    0,S        add result of 1st mult.
         LEAX    1,X        increase X
         STD     0,S        store new number
DIGOUT   PULS    D,PC       return
         *
         EMOD               set module's CRC
THEEND   EQU     *          end of program
         END                tell ASM that you're through!
```

Listing 2:

```
*****************************************************************
*                                                               *
*                 ERROR UTILITY COMMAND - OS-9                  *
*                                                               *
*               Copyright 1984  Brian A. Lantz                  *
*                    All rights reserved                        *
*             from the UNICHARGER utility package               *
*               distributed by Frank Hogg Labs                  *
*                                                               *
*    syntax: error <errnum>                                     *
*                                                               *
*    Lists the corresponding error message from the error file  *
*    (/d0/sys/errmsg) for the specified error number (errnum).  *
*    All leading zeros of errnum are ignored.                   *
*****************************************************************

         NAM  ERROR
         TTL  OS-9 Utility Command (c)1984 Brian A. Lantz
         IFP1
         USE  /D1/DEFS/OS9DEFS
         ENDC
         TTL  OS-9 Utility Command (c)1984 Brian A. Lantz

STDOUT   EQU  1                   STANDARD OUTPUT PATH NUMBER
STDERR   EQU  2                   STANDARD ERROR PATH NUMBER

TYPE     SET  PRGRM+OBJCT
REVS     SET  REENT+1
         MOD  ERREND,ERRNAM,TYPE,REVS,ERRENT,ERRMEM
ERRNAM   FCS  "Error"

*****************************************************************
*                     DATA AREA DEFINITIONS                     *
*                                                               *
*****************************************************************

BUFSIZ   EQU  200                 SIZE OF INPUT BUFFER
         ORG  0
IPATH    RMB  1                   INPUT PATH NUMBER
PRMPTR   RMB  2                   POINTER TO PARAMETER LINE
BUFFER   RMB  BUFSIZ              ALLOCATE AN INPUT BUFFER
         RMB  400                 LEAVE PLENTY OF STACK SPACE

ERRMEM   EQU                      THIS MARKS THE END OF THE DATA AREA

*****************************************************************
*                    SOFTWARE VERSION NUMBER                    *
*                                                               *
```

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```
* This is not necessary, but is needed if you wish to keep     *
* track of your version number using the EDITION number of the *
* IDENT utility. The EDITION number is the first byte after the *
* module name in the program section of code.                  *
****************************************************************

VRSION    FCB  1              VERSION NUMBER 1

****************************************************************
* The following are the two error messages that can be reported *
* by ERROR. The label "ERFILE" is also used as the filename for *
* the error file. If you are using a device other than "/D0",   *
* this line should be changed. For example, "/H0/SYS/ERRMSG" for*
* a hard disk.                                                  *
****************************************************************

ERROR     FCB  $0A

          FCC  /error: cannot open /
ERFILE    FCC  "/D0/SYS/ERRMSG"
          FCB  $0D

NONUM     FCB  $0A
          FCC  /error: no error number given/
          FCB  $0D


****************************************************************
*         ENTRY POSITION OF THE "ERROR" UTILITY COMMAND        *
*                                                              *
* Entry registers used:                                        *
*                        X   ->   parameters from command line *
****************************************************************

ERRENT    STX  PRMPTR         Store the pointer to the command line
          LDA  0,X            Get the first character
          CMPA #$0D           Is it a blank command line??
          BNE  YESNUM         No, there was a number given!


****************************************************************
*  This routine handles the situation of no error number given  *
****************************************************************

ERRNM     LEAX <NONUM,PCR     Point to "no error number given" msg
ERR       LDY  #80            Maximum of 80 characters to be printed
          LDA  #STDERR        Output to the error path
          OS9  I$WRITLN       Print the message
          LBRA OUT            And leave!


****************************************************************
*                   Skip leading zeros                         *
****************************************************************

YESNUM    CMPA #'0            Is the next character a zero ??
          BNE  NOZERO         No, continue with the number!
          LEAX 1,X            Else, move past the zero...
          LDA  0,X            Get the next character....
          BRA  YESNUM         And loop back


NOZERO    STX  PRMPTR         Save current place in parameter line
          CMPA #$0D           End of command line ??
          BEQ  ERR35          Yes, "Unknown error"!!


****************************************************************
*                  Open up the error file                      *
****************************************************************

          LEAX <ERFILE,PCR    Point to the filename
          LDA  #READ.         Open it for read access
          OS9  I$OPEN         Do it!
          BCS  ERR40          If error, can't open file!
          STA  IPATH          Else, store path number

ERR20     LDA  IPATH          Get path number
          LEAX BUFFER,U       Point to the buffer area
```

```
         LDY   #BUFSIZ      Read in a maximum of "BUFSIZ" bytes
         OS9   I$READLN     From the file
         BCS   ERR30        If error, branch!
         PSHS  X,Y          Else, save these registers
         LDY   PRMPTR       Point 'Y' at the parameter

**************************************************************
*   Compare the ASCII Decimal parameter to this error number *
**************************************************************

LP1      LDA   ,Y+          Get this byte from parameter
         CMPA  ,X+          Same as from file ??
         BNE   LP2          No, try again!
         LDA   0,Y          Get next byte from parameter
         CMPA  #$0D         All done with parameter number??
         BNE   LP1          No, continue to loop!
         LDA   0,X          Else, check next file line byte
         CMPA  #$20         Is this number done??
         BEQ   GOTIT        Yes, we found it!!
         BRA   LP1          Else, loop back (to fail)

LP2      PULS  X,Y          Restore these registers
         BRA   ERR20        And try again, with the next line!


MSG      FCB   $0A
         FCC   /ERROR #/


**************************************************************
*                  SUCCESS!! We found it!                    *
**************************************************************

GOTIT    LEAX  <MSG,PCR     Point to "Error #" msg
         LDA   #STDOUT      Output to standard output path
         LDY   #8           8 characters
         OS9   I$WRITLN     (Write 'em!)
         BCS   ERR50        If error, leave (got real troubles)!
         PULS  X,Y          Restore these registers
         OS9   I$WRITLN     And write the line from the file
         BCS   ERR50        If error, leave!
         BRA   OUT          Else, exit without error

WHAT     FCB   $0A
         FCC   /error: unknown error??/
         FCB   $0D

**************************************************************
*      File input has returned an error! End of file ??      *
**************************************************************

ERR30    CMPB #E$EOF        End of file??
         BNE   ERR50        No, troubles! (else, "unknown error")

**************************************************************
*       "I don't think that I quite understand you!!"        *
**************************************************************

ERR35    LEAX <WHAT,PCR     Point to the "unknown error" msg
         LBRA ERR           And print it!

**************************************************************
*  "I can't seem to find that file. Is this the correct disk??" *
**************************************************************

ERR40    LEAX ERROR,PCR     Point to the "can't find error file" msg
         LBRA ERR           And print it!

OUT      CLRB               Return with no error

ERR50    OS9   F$EXIT       End this process; return to parent process!

         EMOD
ERREND   EQU  *
         END
```

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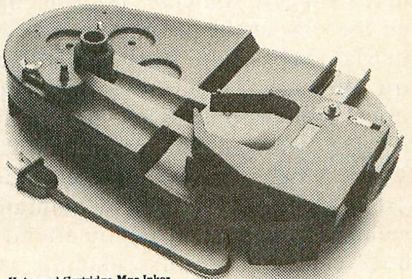

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RAINBOWTECH

ACCESSIBLE APPLICATIONS

Firing Up BASIC09

By Richard A. White
Rainbow Contributing Editor

Last month we prepared a disk with selected portions of OS-9, BASIC09 and *RUNB*. The intent was to be able to back up this disk to provide working disks for each major programming effort, and one or two disks that can be a collection of small projects. Now I will assume you have done this and, disk in hand, are ready to get on with it. And cheers to you who got on with it on your own. Put the disk in Drive 0 and boot up.

For reasons that will be apparant later, I suggest you enter both the date and the time at the prompts — did you put SETIME in your start-up file? Next you will see the BASIC09 copyright notice, BASIC09 on the left margin and READY below it. You are in BASIC09's System Mode. There are three modes, System, Edit and Debug. Commands available from System let you attend to housekeeping chores like loading, saving and other file handling activities as well as issue commands to OS-9.

Commands can be sent to OS-9 by typing the dollar sign ($) and following it with your Shell command. For example, $MFREE will report the amount of free memory. By prefacing your Shell commands with the dollar sign you can do anything you might normally do from OS-9 provided there is enough memory available. The rub is that there isn't much free memory when BASIC09 is resident.

You have some control of memory usage from the System Mode. Enter MEM at the prompt and BASIC09 reports the amount of memory available in its buffer. This is the original buffer size you requested, less the amount taken by any resident procedures. Now, say you want to list a file but there is not enough free memory to load and execute LIST. You typed `$LIST MYFILE`, the disk drive ran, the Error #207 message appeared, and the BASIC09 and READY prompts reappeared. If you set your BASIC09 buffer size at 14K in your start-up file, you can now reduce the buffer from BASIC09's System Mode by typing `MEM 12000`. This reduces your buffer size approximately 2,000 bytes, which should give LIST some elbow room. MEM 14000 will return those 2K bytes if you need them later.

Limited memory forces us to keep our program procedure modules small. This is good since it forces the creation of more maintainable programs. Only a piece of a program is active at any one time. BASIC09 lets us develop these pieces separately and keep them on the disk separately. They are loaded as needed and can be removed from memory when not needed to make room for others. This is even better than PASCAL where all procedures generally are kept in the program before the code that calls them. This also makes it easier to load and edit some module from another program that does nearly what we want rather than starting from scratch.

To reinforce the memory lesson, if you don't specify buffer memory when calling BASIC09, only a 4K buffer is allocated. Both your program and its data must fit into the buffer. But, you can request added memory when you first call BASIC09, or you can use MEM to enlarge the buffer from System Mode of BASIC09.

From System Mode, the DIR command displays the name, size and variable storage requirements of each procedure in the buffer or work space

---

Richard White lives in Fairfield, Ohio, and has a long background with microcomputers and specializes in BASIC programming. With Don Dollberg, he is the co-author of the TIMS *database management program.*

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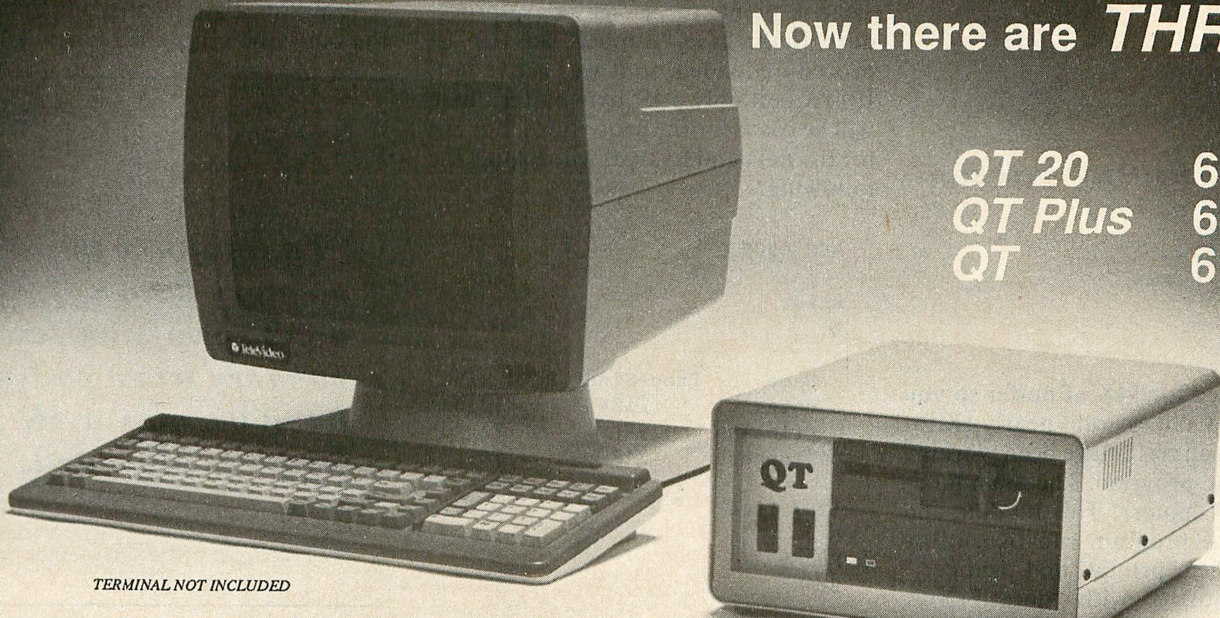

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The QT series:

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The QT Plus series:

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What the manual does not say is that pressing the ENTER key alone does the same thing. Since we have not yet started writing a procedure, the work space should be empty and DIR or ENTER should return the following on the screen.

```
Basic09
Ready
B:

   Name       Proc-Size  Data-Size

13055 free

Ready
B:
```

I had asked for 14K of buffer so you can see that BASIC09 grabs nearly 1K for its own operations. I have been working on a notepad program. The main module is called "notes." This module and others in the program run two utility modules called "printat" and "isupper," which are loaded with "notes." Now when I press ENTER, I get this display.

```
Ready
B:

   Name      Proc-Size  Data-Size
   notes         1134       5038
   printat       82         22
  *isupper       317        54

11537 free

Ready
B:
```

The free memory has been reduced by the amount of memory used for the procedures. The data sizes are reported, but data space has not been allocated at this point. However, there is obviously plenty of space left for the data. The asterisk points to the last active procedure. In this case, "isupper" was the last procedure loaded, so it was active last. If I request only a 4K byte buffer, there will be space for the procedures, but not for the data and BASIC09 will display the following.

```
MEM 4000

Ready
B:

   Name      Proc-Size  Data-Size
   notes         1134       5038?
   printat       82         22
  *isupper       317        54

1297 free

Ready
B:
```

BASIC09 knows that there is not enough memory to run "notes" and flags the fact with a question mark following the data size.

With BASIC09, you will get to know and love the friendly asterisk. Think of it as meaning all or all the way, depending on the context in which it is used. It is particularly useful when saving, killing and packing programs with a number of modules in the work space. If I type `SAVE NOTES` the procedure "notes" will be saved to a file on disk named "notes." If I type `SAVE* NOTES`, the procedures "notes," "printat" and "isupper" will all be saved to one file on disk named "notes." The next time I load notes, all three procedures will be loaded.

Procedures are written and edited in the Edit Mode. Type `EDIT`, or `E`, and the procedure name and you will be in Edit. Lowercase works as well, and I usually stay in lowercase.

> ***"To reinforce the memory lesson, if you don't specify buffer memory when calling BASIC09, only a 4K buffer is allocated."***

Color BASIC gives you the capability to start printing anywhere on the screen with `PRINT@`. BASIC09 lacks `PRINT@`, but has a way to position the cursor at a particular column and row. It's a tad awkward, so I put the code to do this in a short utility named "printat." For tutorial purposes it is an excellent first program, for it is both simple and will be continually usable as you program in

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BASIC09. It is called with this line in a BASIC09 procedure.

```
RUN printat(col,row)
```

To write "printat," we enter the Edit Mode and proceed to type it in. Here is what your screen will show. The E: is the Edit Mode prompt.

```
Ready
B:e printat
PROCEDURE printat
*
E:
```

Edit Mode is a line-oriented text editor. Compared to a screen-oriented editor like *TSEDIT*, *Telewriter* or *DynaStar*, line editors leave much to be desired. Still, BASIC09's editor has certain advantages that make it the preferable editor for entering BASIC09 programs. First, it checks the syntax of each line as it's entered. Next, when you leave the Edit Mode, a check is made for other types of programming errors, for example, incomplete control structures such as FOR without a NEXT. Finally, it is able to deal with line numbers or do without them. There are 19 editor commands. I will discuss only a few.

A line of text is preceded by a space. This is perhaps the hardest thing to remember since it is different from most other word processors you may be more familiar with. The editor tries to interpret a non-space character immediately after the E: prompt as a command character. An asterisk immediately following a command character means all or go all the way. If the plus sign (+) means move forward one line, +10 means move forward 10 lines and +* means go to the end of the program. An ENTER alone moves you forward one line. The minus sign (-) moves you backward in the program, -10 means go back 10 lines and -* means go back to the beginning.

There are commands: to change, c; delete, d; list, l; renumber, r; and s (search for a string). These apply to the current line or the next occurrence of a string in a change or search command, except when followed by the asterisk meaning all. Of these commands, only LIST can be followed by a number meaning the number of lines forward to be listed.

The change command is a single-line, text substitution editor. You follow the 'c' with a delimiter character such as a slash, comma or period. You choose the delimiter so it is different from any character in the original text string or the substituting text string. Next comes the original text string, another delimiter character (it must be the same character as the first delimiter) and the text string to be substituted. A final delimiter is optional. You cannot change a line number with the 'c' command. That is what 'r' is for.

The most important command is 'q', which allows you to quit editing and return to System Mode. But be warned: quiting is not always graceful. Here is where errors that are non-syntax in origin are reported, sometimes at great length. Don't worry if some get lost off the screen. From System Mode you can list your procedure to the printer and all the errors are printed at the end of the listing. Just another service from friendly BASIC09.

The operation of all these commands is well-covered in the BASIC09 manual. Read it and practice.

Following is the entire "printat" procedure.

```
PROCEDURE printat
 0000        PARAM col,row:INTEGER
 000B        PRINT CHR$(2); CHR$(col+32); CHR$(row+32);
 0021        END
```

The numbers in the left column are the number of bytes from the start of the procedure file to the start of each line in Hex. If you enter your program in lowercase, BASIC09 will change all BASIC09 keywords to capitals and leave variables and procedure names in lowercase. BASIC09 does some other text formatting to improve readability, including automatic indenting and removal of unnecessary spaces and parentheses.

A PARAM statement is a special type of dimension statement that defines variables to which values will be passed by the calling procedure. In this case, integers for the column and row position of the cursor will be sent. The ability to pass various types of data to and from a procedure makes modular programming possible.

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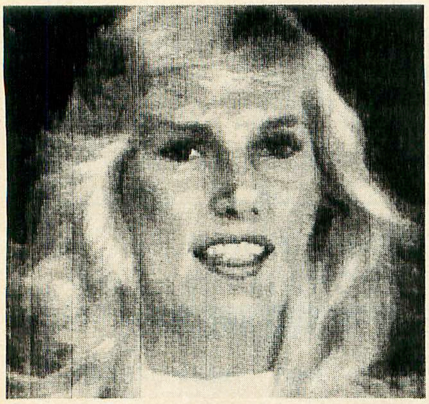

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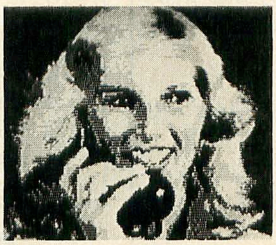

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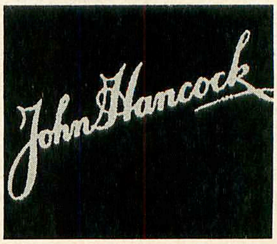

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In BASIC09, if a simple string or numeric variable is used without being declared in some way, the variable will be automatically dimensioned with a default size. A string will be set to 32 characters, while a number will be real (floating point decimal). These defaults will seldom be the ideal. Integer and byte variables take less memory, run faster and can be used in most cases. A string may be as short as one character to get a 'y' or 'n' response, or can be thousands of bytes long to form a buffer into which characters are poked. Always declare your variables with DIM or PARAM.

OS-9 makes available a number of control codes to manage the alpha and graphics screens. These codes are summarized on Page 131 of your red OS-9 commands manual. BASIC09 uses them by printing them to the standard output. OS-9 intercepts them and routes them for action. The code "02" initiates the position alpha cursor operation, which is followed by two values, one for the column across the screen plus 32 and the other for the row down plus 32. The screen starts at Column 0, Row 0. An ending semicolon (;) holds the cursor at the selected location and END sends control back to the calling procedure.

The procedure "isupper" is designed to convert lowercase letters in a string to uppercase. One use is to convert menu and prompt response characters so you need only test for uppercase characters.

```
PROCEDURE isupper
 0000       DIM count,line_length:INTEGER
 000B       PARAM answer:STRING[25]
 0017       DIM ascii:INTEGER
 001E       DIM char:STRING[1]
 002A       DIM work_string:STRING[25]
 0036
 0037       count:=1
 003E       line_length:=LEN(answer)
 0047       work_string:=""
 004E
 004F       WHILE count<line_length+1 DO
 005F         ascii:=ASC(MID$(answer,count,1))
 006E         IF ascii<96 THEN
 007A           char:=CHR$(ascii)
 0083           work_string:=work_string+char
 008F           count:=count+1
 009A         ELSE
 009E           char:=CHR$(ascii-32)
 00AA           work_string:=work_string+char
 00B6           count:=count+1
 00C1         ENDIF
 00C3       ENDWHILE
 00C7
 00C8       answer:=work_string
 00D0       END
```

All "isupper" variables are DIMensioned at the start of the procedure. The contents of the string variable "answer" will be supplied by the calling procedure so it is dimensioned using the keyword PARAM. All other variables are local to "isupper" and are dimensioned using the keyword DIM. A number of variables of the same type may be included in a single DIM statement as long as they are separated by commas. Variables "count" and "line_length" are in the same statement and "ascii" could have been added as well. String variables "char" and "work_string" require different dimensioning statements since their lengths are different.

Variables declared with DIM are local to the procedure where they are declared. This means you can use the same variable name in another procedure to mean something entirely different. Compare this to Color BASIC where variables are global and have a single meaning anywhere in the program.

You can write an assignment statement four ways. The forms "LET count=1", "LET count:=1", "count=1" and "count:=1" will all work. The last, "count:=1," models PASCAL syntax and is preferred.

After the variables are declared they must be initialized. Variable declaration sets aside memory space for the variable, but does not change what is in that memory space, which could be anything. This also is different from Color BASIC where all numeric variables are initialized to zero and all strings are set to null when a program is first run. So, the statement "work_string:=""" is vital if "isupper" is to function.

`FOR...TO...NEXT` is the only loop control statement in Color BASIC. BASIC09 provides four plus a special form of `IF/THEN` (EXITIF...THEN...ELSE...ENDEXIT) to escape from a loop. I choose to use the WHILE...DO...ENDWHILE in "isupper" though I could have used any of the looping control structures. WHILE...DO makes a test at the very beginning and does the code in the loop only if the test proves "true." If "isupper" is sent a null string, and line_length=0, the program jumps over the WHILE...DO and returns "answer" unchanged to the calling procedure. This avoids an error in the statement ascii:=ASC(MID$(answer ,count,1)).

The contents of "ascii" will be the ASCII value of a character from the "answer" string. If this value is less than 96, the character must be a non-lowercase character and can be added directly to "work_string." If the character is lowercase, 32 is subtracted from its ASCII value yielding the ASCII

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Saturday
— CoCo Community Breakfast at 8 a.m.
— Exhibits open at 10 a.m. and close at 6 p.m.
Sunday
— Exhibits open from 11 a.m. to 4 p.m.

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Many of the people who write for THE RAINBOW — as well as those who are written about — are there to meet you and answer your questions. You'll also meet lots of other people, just like you, who share your interest in the Color Computer. It's a person-to-person event, as well as a tremendous learning experience, in a fun and relaxed atmosphere.

To make it easier for you to participate, we schedule RAINBOWfests in three parts of the country. If you missed the fun in Palo Alto, California, why don't you make plans now to join us in Chicago? For members of the family who don't share your affinity for CoCo, you'll be comfortable knowing that RAINBOWfest is located in an area with many other attractions.

The Hyatt Regency-Woodfield offers special rates ($60, single or double room) for RAINBOWfest. The show opens Friday evening with a session from 7 p.m. to 10 p.m. It's a daytime-only show Saturday — the CoCo Community Breakfast (separate tickets required) is at 8 a.m., then the exhibit hall opens promptly at 10 a.m. and runs until 6 p.m. There will be no exhibition hours or seminars Saturday evening. On Sunday the exhibit hall opens at 11 a.m. and closes at 4 p.m.

Tickets for RAINBOWfest may be obtained directly from THE RAINBOW. We'll also send you a special reservation form so you can get your special room rate.

Come to RAINBOWfest!

PCMfest Your admission to RAINBOWfest also entitles you to visit PCMfest! It's a show focusing on Tandy's new generation of computers — the Tandy 1000, 1200, 2000 and 3000 MS-DOS computers, and the Tandy 100, 200 and 600 portables.

PCMfest is sponsored by our sister publication, PCM, *The Personal Computer Magazine for Tandy Computer Users.* The show will be in the same location as RAINBOWfest and the exhibit hours will be exactly the same. If you use one of the newer Tandy computers, don't miss it.

Join us at a future RAINBOWfest!

RAINBOWfest - Princeton, N.J.
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Advance ticket deadline: May 16, 1986. Orders received less than two weeks prior to show opening will be held for you at the door. Tickets will also be available at the door at a slightly higher price. Tickets will be mailed six weeks prior to show. Children 4 and under, free; over 4, full price.

value of its uppercase equivalent. The character having this value is found and added to "work_string."

Each control structure has a unique END word. This is because these structures may span many lines of code and BASIC09 has no other way of knowing what belongs with the control structure and what does not. Color BASIC is no different. Each `FOR` must have a `NEXT`, which may be many lines down. `IF...THEN...ELSE` must be on a single line so the next line number gives Color BASIC the structure termination information it needs. In "isupper" ENDIF terminates the `IF...THEN...ELSE` structure. The following ENDWHILE does the same for WHILE...DO, sending the program to the test in the WHILE...DO. If the test is false, control goes to the line following ENDWHILE.

> ***"OS-9 makes available a number of control codes to manage the alpha and graphics screens. These codes are summarized on Page 131 of your red OS-9 commands manual."***

This line, answer:=work_string, assigns an all uppercase string to "answer," which returns it to the calling procedure. The END is optional, but is good programming practice making the procedure more readable.

You can run "printat" and "isupper" from BASIC09's System Mode, but you will not fully see what they do. A better way is to write a short procedure that uses each and demonstrates what they do, as the following "demo" procedure does.

```
PROCEDURE demo
 0000       DIM temp$:STRING[1]
 000C       DIM answer:STRING[25]
 0018       REPEAT
 001A
 001B         PRINT CHR$(12)
 0020         PRINT
 0022         PRINT "Enter string."
 0033         PRINT
 0035         GET #0,answer
 003E         RUN isupper(answer)
 0048         RUN printat(2,10)
 0053         PRINT answer
 0058         RUN printat(2,12)
 0063         PRINT "Enter another? y/n"
 0079         RUN printat(2,14)
 0084         GET #0,temp$
 008D
 008E         RUN isupper(temp$)
 0098       UNTIL temp$="N"
 00A4       END
```

The procedure "demo" uses only two variables that are both dimensioned with DIM statements. The variable "temp" is one character long and is used to get single key responses from the keyboard. String variable "answer" can take up to 25 characters from the keyboard.

A REPEAT...UNTIL loop makes its test at the end of the loop, so its code will always be executed at least once. It is an excellent control structure where you want to repeat until the user indicates "quit" with a particular keystroke.

Printing `CHR$(12)` clears the screen. This is the same as `CLS` in Color BASIC.

"GET #0,answer" gets characters from the keyboard, path #0, and puts them into the variable "answer" until its 25-character limit is reached or until it sees a carriage return (ENTER).

The procedure "isupper" is run with the string "answer" supplied as a parameter. It converts the string to all uppercase and returns the string in the variable "answer," which is printed to prove the fact to you. Notice the use of "printat" to position the cursor on the screen. Actual numbers are used as parameters, but these could have been integer-type variables.

Finally, the user is asked if he wishes to enter another string. Since a single character response is needed, the one character string variable "temp$" is used in the GET statement, eliminating the need for the user to type both the character and an ENTER. The statement "RUN isupper(temp$)" does any needed case conversion. If temp$="N", the test after UNTIL is true and the procedure ends. Note that when testing for equality, temp$="N", only the equal sign is used, the colon-equal symbol (:=) is reserved for assignment statements only.

We have covered a little about a lot of things in this article. We have seen part of the operation of the System and Edit modes. I have also given you two useful procedures and a program to demonstrate them to get you some hands-on programming. I have passed right by some things I don't use as much, if at all. We will pick some of these up in later columns.

Our last bit of business is how to depart BASIC09 from the System Mode. Type `bye` and press the ENTER key.

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At last - The book exclusively for you and your CoCo !! You've learned BASIC and are now ready to learn assembly language programming. This hands-on guide begins with the basics and progresses to the expert level; revealing programming conventions and techniques and all the internal capabilities of the TDP-100, CoCo 1 and 2. At every step of the way are illustrations, sample programs, and plain English explanations. All sample programs are shown as assembled with Radio Shack's EDTASM+ cartridge. Plus, a complete chapter explains how to use all EDTASM+ capabilities. This book describes how to write subroutines, interrupt handlers, programs that control the graphics display modes, cassette, disk, keyboard, sound, joysticks, serial I/O, interrupts, and use of ROM resident subroutines. Not only is the MC6809E microprocessor described, but also the video display generator (VDG), peripheral interface adapters (PIA), and how they all work together. This book is suitable as a high school or college textbook.

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BARDEN'S BUFFER

Listening to Your CoCo with Assembly Language

By William Barden, Jr.
Rainbow Contributing Editor

One of the nice things about assembly language is that it gives you access to parts of the computer that just can't be handled through BASIC. Take sound effects and music, for example. Sure, you can use SOUND in Extended BASIC to sound a tone for a certain length of time. You can also use the PLAY command in Extended BASIC to play musical notes. However, with BASIC you are limited to these short, simple tones. Assembly language, on the other hand, allows you to create a variety of complex sounds. Want a car crash, a phaser blast, or the sound of an Apple IIe being dropped from the top floor of One Tandy Center? Assembly language is the only way to go. Would you believe that these sounds are already programmed into your CoCo? I'll show you how to unleash the CoCo's sounds in this column. Actually, there'll be two major themes this month. First, we discuss assembly language sounds. Secondly, I'll show you how to plan and use a *Sound* program, for those of you who are still a little shaky about using *EDTASM+* or Disk *EDTASM*. As I mentioned last month, you OS-9 users can still benefit from the column, but the examples will be in *EDTASM* format.

Color Computer Sounds

Sounds on the Color Computer are generated quite differently from sounds on the Tandy 1000 or other systems. Many other systems contain a sound synthesizer chip. This is an integrated circuit similar in appearance to many of the chips you'll see inside the CoCo. Internally, though, a sound synthesizer chip contains logic to generate square waves or sine waves and to create different envelopes that determine the wave shape.

The Color Computer does not use a sound synthesizer chip. Instead, it creates sounds by electronic logic that makes up a digital-to-analog converter. I'll call this logic a DAC for short. The CoCo DAC is a "six-bit" DAC, meaning that it will convert a digital value of zero through 63 into 64 different voltage levels. The CoCo DAC uses the upper six bits of a byte in the conversion. Here are the results we'll get with a range of values:

Digital Value	Voltage Output
00000000	.23 volts
00000100	.30
00001000	.37
00001100	.44
00010000	.52
00010100	.59
00011000	.66
.	.
.	.
.	.
11111000	4.69
11111100	4.76

Bill Barden has written 27 books and over 100 magazine articles on various computer topics. His 20 years experience in the industry covers a wide background: programming, systems analyzing and managing projects ranging from mainframes to microcomputers.

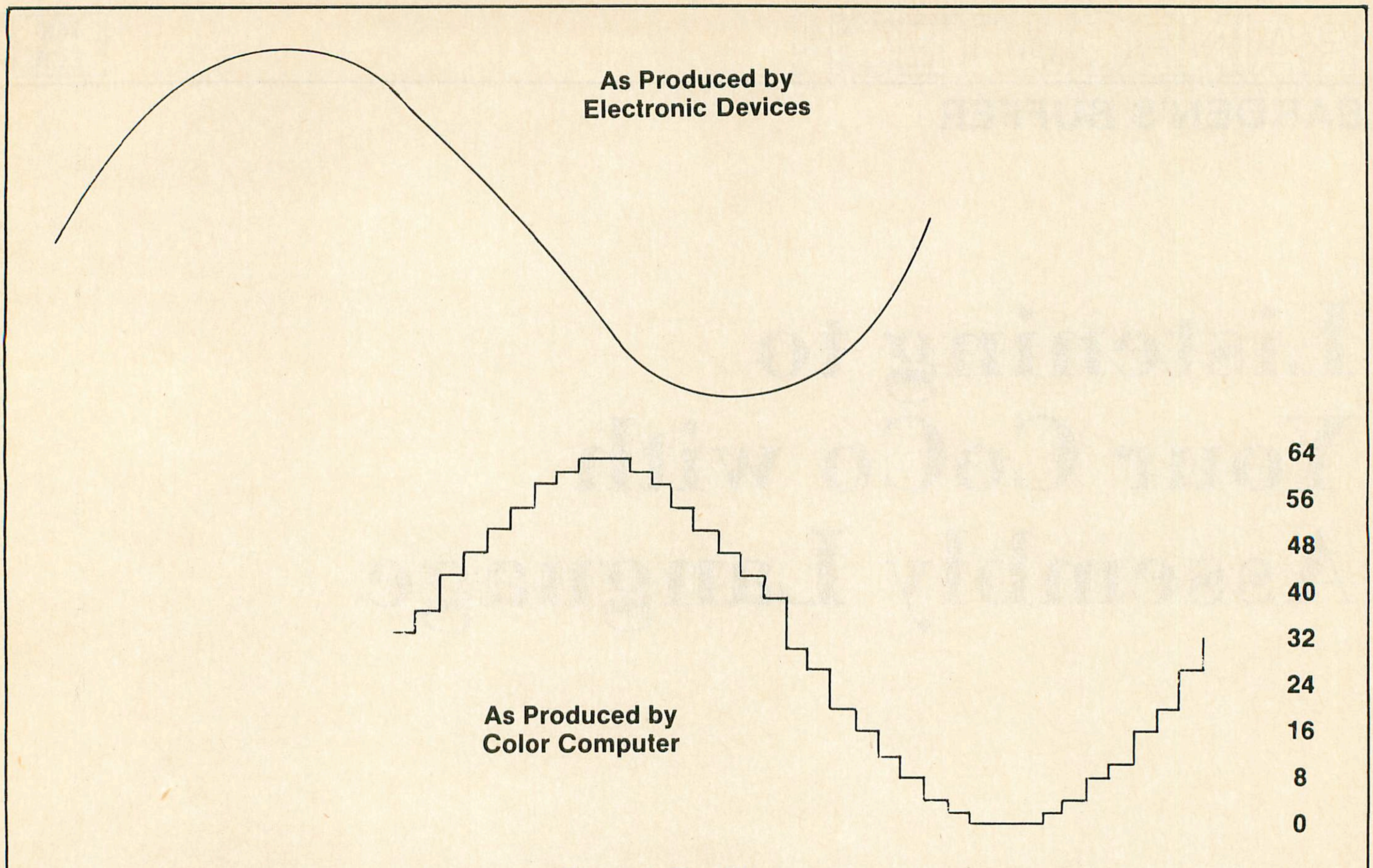

Figure 1: Sine Waves

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THE RAINBOW's One-Liner Contest has now been expanded to include programs of either one or two lines. This means a new dimension and new opportunity for those who have "really neat" programs that simply just won't fit in one line.

Here are the guidelines: The program must work in Extended BASIC, have only one or two line numbers and be entirely self-contained — no loading other programs, no calling ROM routines, no poked-in machine language code. The program has to run when typed in directly (since that's how our readers will use it). Make sure your line, or lines, aren't packed so tightly that the program won't list completely. Finally, any instructions needed should be *very* short.

Send your entry (preferably on cassette) to:

THE RAINBOW One-Liner Contest
P.O. Box 385
Prospect, KY 40059

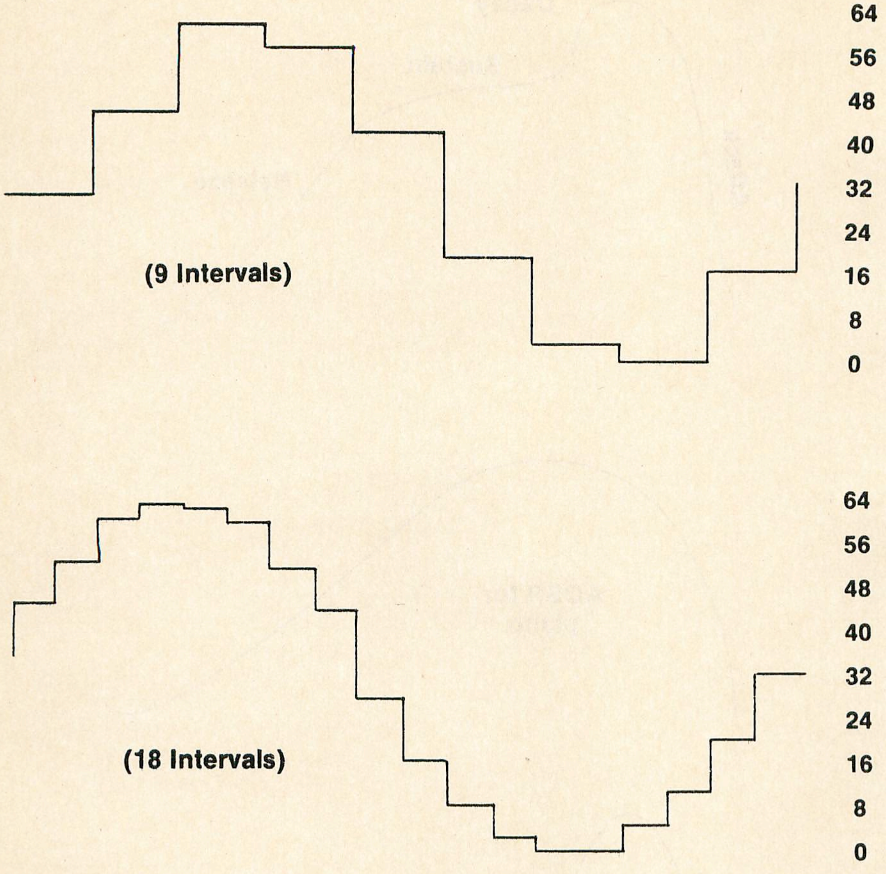


Figure 2: Staircase Steps in Wave Forms

Note that the the lower two bits of the digital value are always zero — only the upper six bits change. You can also see that the step size of the voltage output is constant. There is always about 0.07 volts between one digital value and the next.

All well and good, but how does the DAC create sounds? Let's take an example. The purest sound is a sine wave, shown in Figure 1. The second part of the figure shows a comparable sine wave generated by the DAC. When fed into an audio amplifier, the result will be a relatively pure musical tone, similar to that produced by an electronic doorbell, or a Dolby test tone.

If you look closely at the DAC sine wave, you can see that it's made up of a series of discrete voltage levels, giving it a "staircase step" appearance. The closer the interval is between steps, the smoother the sine wave becomes, as shown in Figure 2.

This sine wave was generated by the CoCo DAC from a table in ROM. Believe it or not, this is the way the CoCo generates the 1200 and 2400 hertz (cycles per second) tones used for cassette tape output! (I'll tell you where to find the table later.)

The distance from crest to crest, or from trough to trough of the sine wave is called the *period* of the sound. The reciprocal of the period is the *frequency* of the sound. A 600 hertz tone, then, has a period of 1/600 seconds or about 1.66 milliseconds (1.66 thousandths of a second).

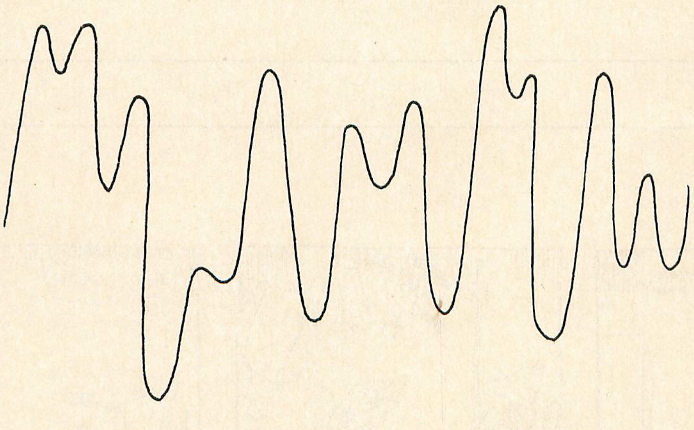


Figure 3: Typical Wave Form of Complex Sound

More Complex Sounds

Imagine tuning in MTV and listening to a new heavy metal band playing sine wave synthesizers. It would drive the viewers to Mozart! Most natural and instrumentation sounds are made up of a combination of frequencies, as shown in Figure 3. Random sounds, such as surf or crowd noise, are made up of an even combination of all frequencies, giving a hissing effect. These are the sounds that BASIC cannot create on the CoCo with simply the `SOUND` and `PLAY` commands.

A music synthesizer not only provides the capability to generate the complex sound of strings or a flute, but it also allows the user to define an envelope for the sound. The envelope describes how the sound varies in loudness and is sometimes called an ADSR, for attack, decay, sustain, release, as shown in Figure 4. A musical instrument such as a piano has a sustained sound, while an instrument such as a snare drum has a much shorter duration sound. Both envelopes are different, as shown in the figure. Synthesizers also provide the capability to create envelopes not produced by musical instruments, such as a sound that starts off at the minumum loudness and builds to a maximum, producing a sound like a musical tone played backwards on a tape recorder.

Many complex sounds can be generated by the CoCo, at the expense of building a table of values that define the wave shape of the sound. Another alternative is to use the patterns found in the CoCo's ROM, selecting those that produce the sounds you're looking for. A short section of BASIC ROM code from $A9EB through $A9FF on my systems, for example, produces the wave shape shown in Figure 5 when the upper six bits are considered.

Any small section of code can be repeated over and over, and the interval between outputs to the DAC can be varied by timing loops within the assembly language program to produce different frequencies. As the shortest timing loop can produce periods that are about 10 microseconds wide, the highest frequencies that can be produced in assembly language are 100,000 hertz radio waves (!), far above the 6,000 hertz sound waves that can be passed through the CoCo electronics. That's the beauty of assembly language here — there's plenty of time left over.

Talking to the PIA of the CoCo

The output of the DAC goes both to the cassette output and to a device that

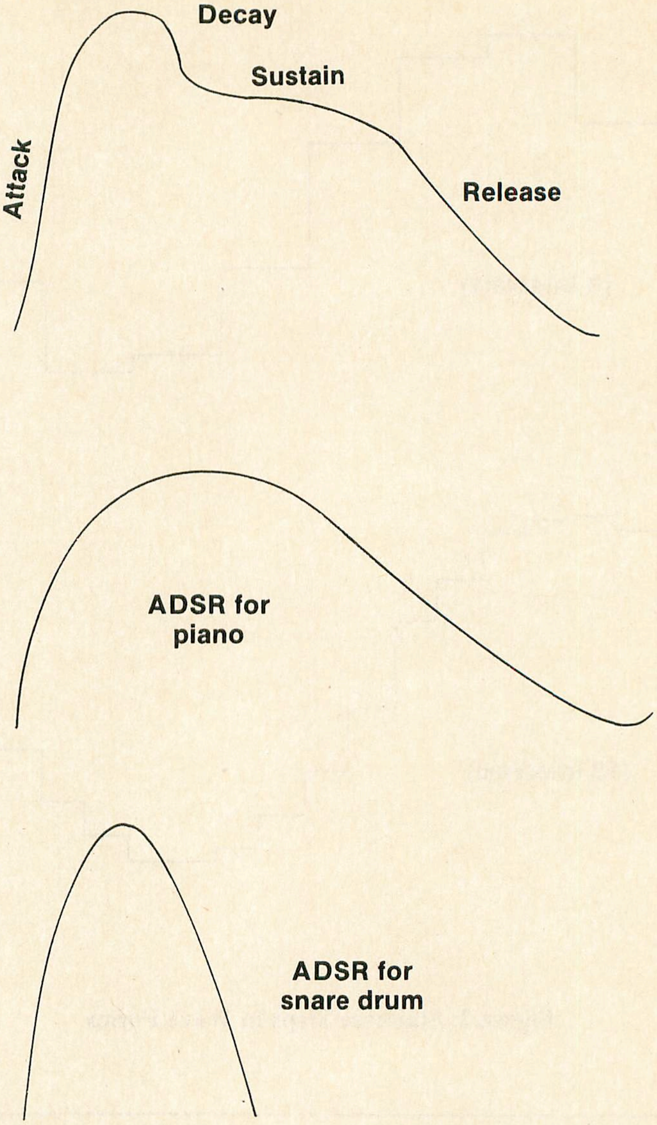
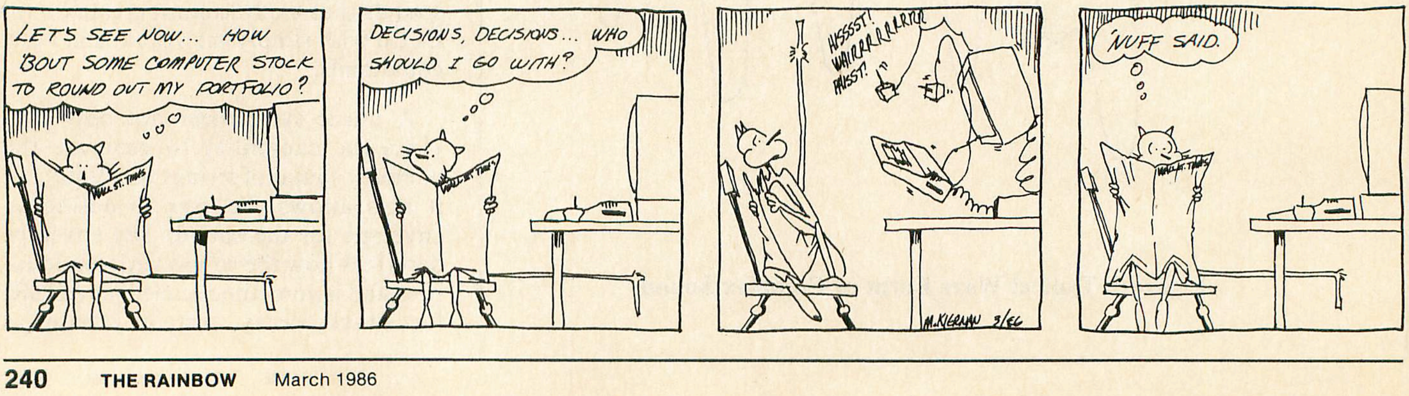

Decay
Sustain
Attack
Release
ADSR for piano
ADSR for snare drum

Figure 4: Sound Envelopes

CoCo Cat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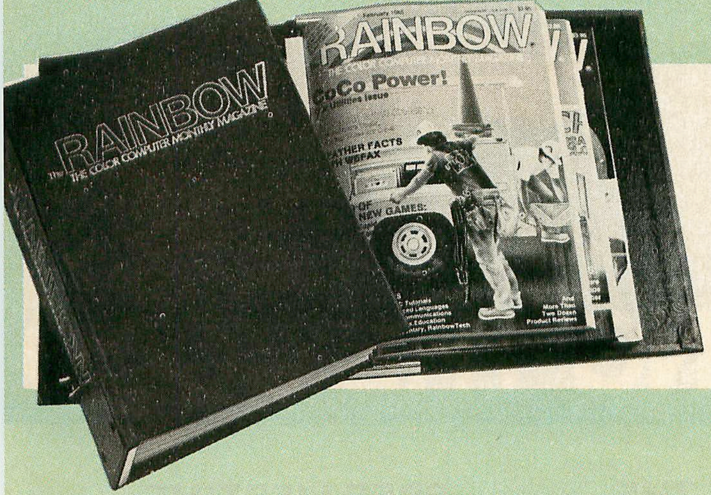

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The CoCo Special Interest Group (SIG) features a variety of services, including an open forum where you can send and receive messages from Color Computer owners all over the world. It also has several databases to which you can upload your favorite programs and from which you can download programs written by other CoCo enthusiasts. Some of these databases are BASIC programming, OS-9 and home applications.

When setting up your account with Delphi, if you do not have a credit card or prefer not to use it, Delphi requires that you send $20 to give your account a positive balance. This will be refunded after your first free hour if you choose to no longer use the system or it will be applied to future connect charges.

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The CoCo SIG's conference feature allows you to meet electronically with other members of the CoCo Community. You can join conferences with notables such as Fred Scerbo, Dan Downard, Ed Ellers, Lonnie Falk, Dick White, Tony DiStefano and others — on a regular basis. Conference schedules will appear in THE RAINBOW each month. Be sure to check online announcements for changes and additions.

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We also have a number of **programs that you can download** and use, just for the cost of the time you spend transferring them. There'll also be **corrections for RAINBOW articles**, helpful hints and many other useful features.

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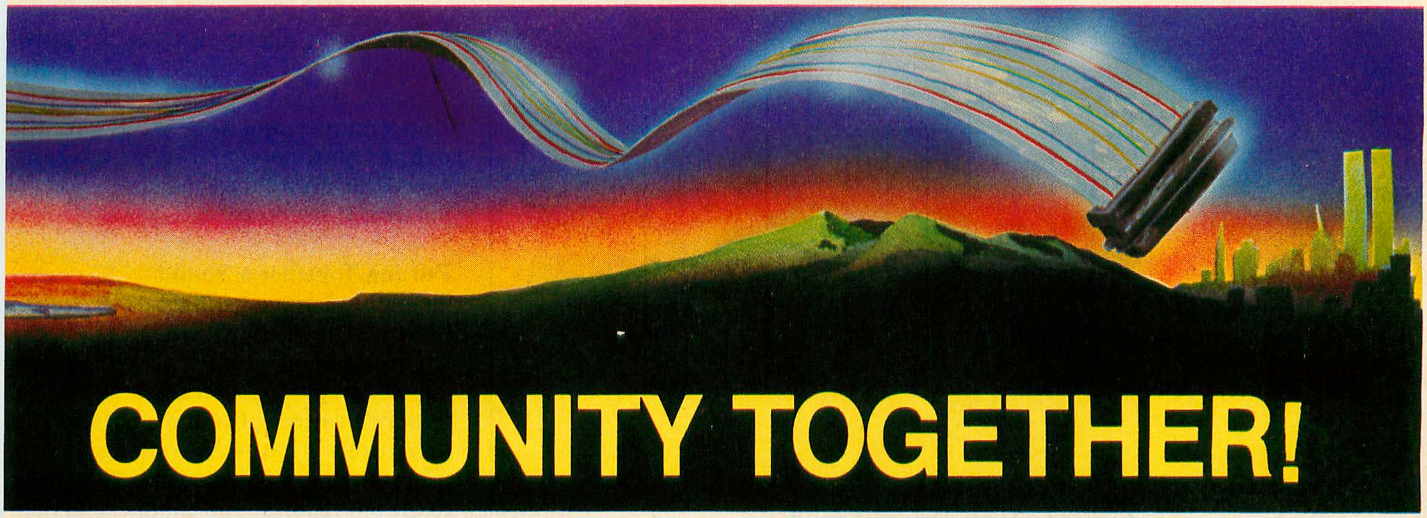
COMMUNITY TOGETHER!

How to reach RAINBOW's Color Computer SIG . . .

There are several ways to connect to Delphi and THE RAINBOW's CoCo SIG. In most cities you will not even have to pay long distance charges; you can use special data communications networks, like Uninet, Tymnet and the Canadian Datapac network.

First, set your terminal program to operate at either 300 or 1200 Baud (depending on the modem you have), and also select either 7 bits with even parity or 8 bits with no parity, and one stop bit. (If one combination doesn't work, try another.)

Decide which network you should use. There is no surcharge for Uninet or Tymnet. Canadian residents using Datapac will be charged an additional $12 (U.S.) per hour.

On Uninet: Call (800) 821-5340 to get the Uninet number for your area. After you call the appropriate number for your own area and make connection, you'll see a prompt of "L?" Press ENTER, the period key (.) and ENTER again. At the "service:" prompt, type `GVC` (for General Videotex Corporation) and ENTER.

On Tymnet: Call (800) 336-0149 to get the Tymnet number for your area. After you dial your designated number and connect, you will see either "garbage" or a message saying "please type your terminal identifier." At this point, even if the screen is garbled, simply press 'A'. When "please log in:" appears, type `DELPHI` and press ENTER.

From Canada (on Datapac): Call Delphi Customer Service at (617) 491-3393 to get the Datapac number for your area. After you connect, press the period key (.) and ENTER (use two periods if you're using 1200 Baud). Type `SET 2:1, 3:126` and press ENTER. Now type `p 1 3106, DELPHI;` and press ENTER. Delphi's new rates indicate an additional $12 hourly surcharge for evening use of Datapac, which means a total of $18 (U.S.) for connect time.

From other countries: Many countries have their own data networks that can connect to either Uninet or Tymnet. Check with the telephone authorities in your country for details on how to sign up for this service. When you have an account set up, you can reach Delphi with a "host code" of 312561703088 through Uninet, or 310600601500 through Tymnet. (You'll have to pay the toll charges for this connection.)

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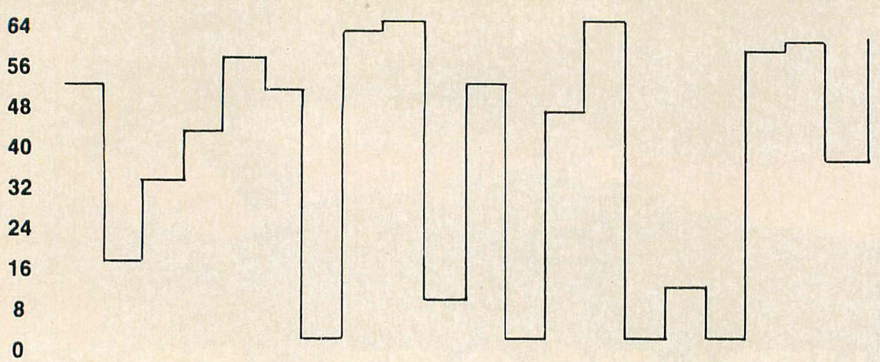

Figure 5: Table Driven Sounds

routes the DAC output to the television sound channel, as shown in Figure 6. The MC14529 routes the DAC output to the TV sound channel by two "select" bits set by the following BASIC commands:

```
180 POKE &HFF01,PEEK(&HFF01)
    AND &HF7 'select bit 0
190 POKE &HFF03,PEEK(&HFF03)
    AND &HF7 'select bit 1
200 POKE &HFF23,PEEK(&HFF23)
    OR 8 'set 6-bit sound
```

The third `POKE` here sets six-bit sound as opposed to a single-bit "on/off" sound that can also be used.

Once these commands are given, they need not be output again — the DAC is routed to the TV sound channel for the duration of the program.

The six inputs to the DAC are controlled by six signals from another source, as shown in the figure. The source here, as in the case of the two select signals, is a PIA, or peripheral interface adapter. The CoCo uses a number of PIAs to provide programmable signals to control color graphics, sound, cassette operations, and RS-232-C operations, to name a few. In this case, the PIA acts as a simple memory device, holding whatever six bits have been sent to it until another six bits are sent. In BASIC the six PIA to DAC outputs are set by

```
1000 POKE &HFF20, VALUE*4
     'VALUE is 0 - 63
```

In assembly language, the instructions are very similar:

```
LDA #VALUE     value is VVVVVV00
STA $FF20      outputs value to DAC
```

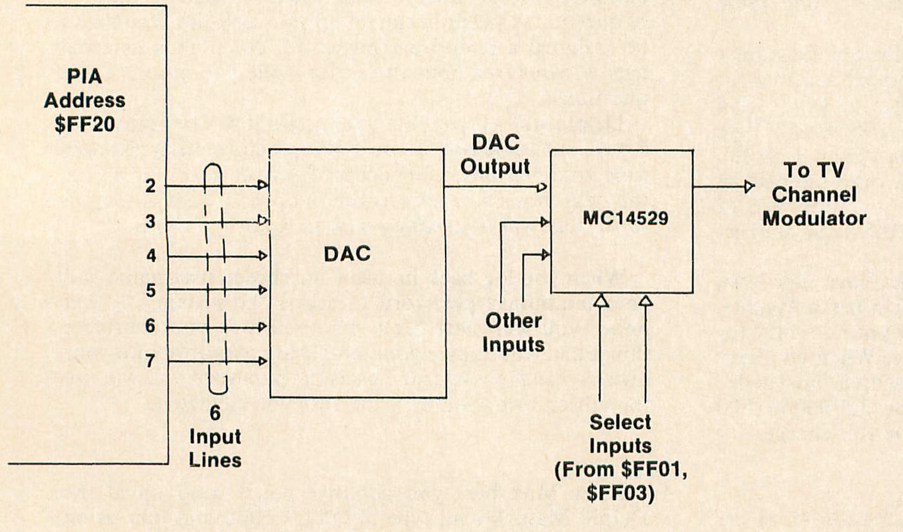

Figure 6: DAC Routing

And that's about all there is to producing sounds on the Color Computer — route the DAC output to the television channel and then send out the proper patterns to the PIA/DAC, spaced at even intervals, repeating the patterns if necessary.

Putting Together a Sound Assembly Language Program

Now that we know enough about the sound capabilities of the Color Computer, we can put together a short program to play a variety of sounds, natural and unnatural. What we're looking for is a program that will route the DAC output to the television sound channel and then output a series of digital values to the DAC, spaced at regular intervals. We also need the capability of repeating a series of values for a certain number of times.

The data that creates the sounds will be held in a table in memory, either a table of values that already exist, such as ROM values, or a table that we will create. Since we want to make the program handle a table of varying length, we'll need to specify a table length. An alternative to this is to use a "terminating value" at the end of the table to mark the end. However, we'd like to use ROM data for some of the sounds, and it's awfully difficult to write data to ROM (although one of my CoCos tries this on occasion).

To make the table values easier to generate, we'll also let the program shift the data so that it's aligned in the upper six bits. That way we can put values of zero through 63 in memory bytes without having to worry about what the values would be in their shifted form. Of course another approach is to "pack" the data into consecutive six bits, but this would present a real chore in creating and maintaining the table of data values.

What we have so far, then, is a program that will read a table of values starting from some given memory location and ending at another memory location, with each byte in the table representing an output value of zero through 63. Such a table is shown in Figure 7 — it's the encoded form of a simple bell sound using a square wave frequency.

Another thing that we need to specify to the program is the interval between DAC outputs. Remember, the smaller the increment, the less rough the final wave shape will be. What is a reasonable increment to implement? We know that

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we'll have to have a timing loop in the program to count off the time between DAC outputs. (Another alternative, however, would be reading in a PIA bit that shows the sync clock for video, appearing every 63.5 microseconds.) Even with assembly language, instructions take a finite time and we can't define a small enough interval by the time the program is coded. We'll let the interval be specified by a count parameter to the assembly language program and see what the minimum interval turns out to be in the final result.

A final parameter that must be specified to the program is the number of times the table must be repeated. A repeat capability is handy to have to generate wave forms that are periodic, such as the sine waves and square waves mentioned above. We may want to repeat thousands of times with short tables of values to get a sound that is seconds long.

At this point we have these parameters that must be passed to the assembly language program:

- A 16-bit address that specifies the start of the table.
- A 16-bit address that specifies the end of the table.
- A 16-bit delay count that determines the time delay between outputs to the DAC.
- A 16-bit repeat count that determines the number of times that the table data is to be repeated.

Program Design Considerations

Before we start coding the program we need to make several more decisions about the basic design:

- Is this to be a program or a subroutine?
- Where in memory will the program be?
- Where in memory will the table be?

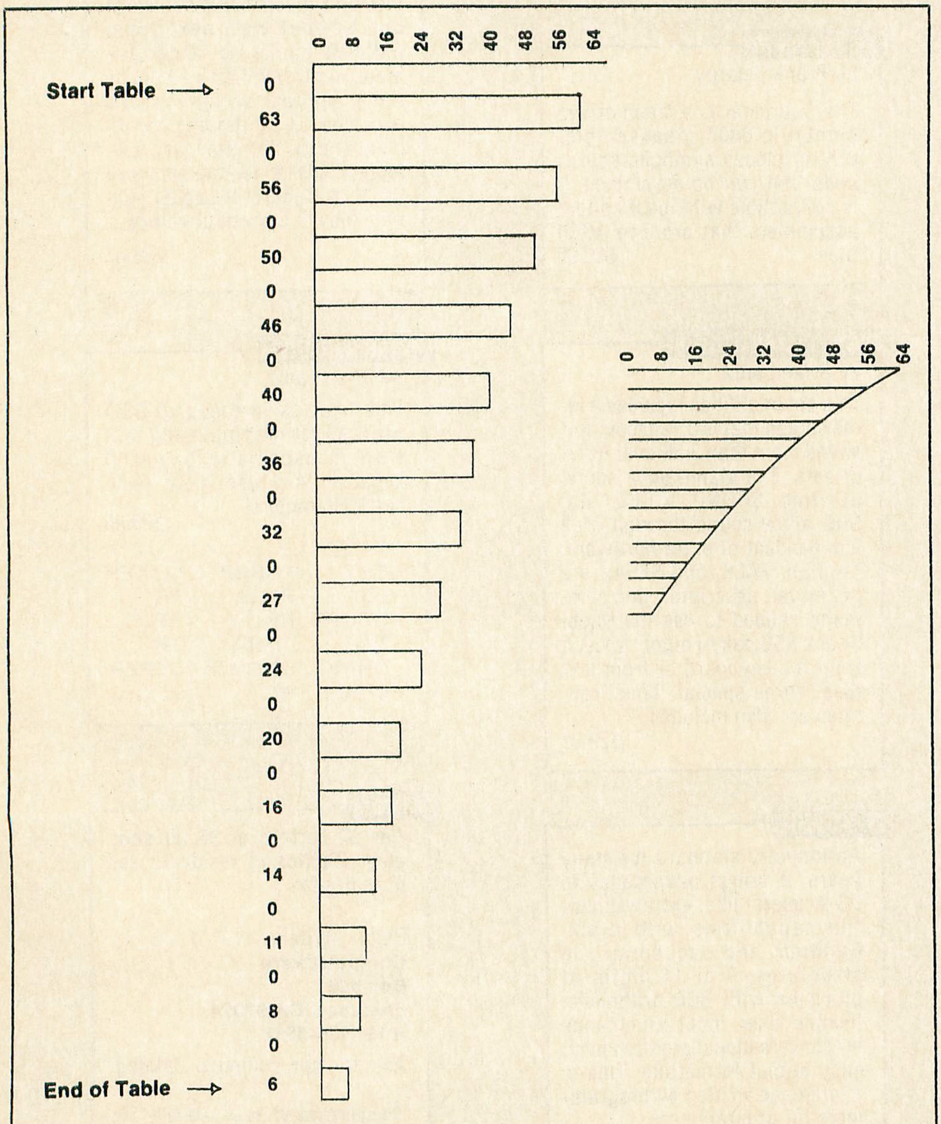

Figure 7: Table for Bell Sound

Programs Versus Subroutines

We could make the *Sound* program a full fledged program that could be loaded by `LOADM` and executed by `EXEC` (or from cassette by `CLOADM` and `EXEC`). However, this doesn't make too much sense, as the program isn't really a full-blown program, but simply a short piece of code that can be used to (presumably) generate short snatches of sounds. For that reason, it makes better sense to design it as an assembly language subroutine that can be called by BASIC (or other languages). That way we can use the convenience of BASIC to do all of the housekeeping and just call the assembly language subroutine when a sound is required.

The commands that Extended BASIC uses to interface to assembly language are `DEFUSR` and `USR`. `DEFUSR` tells BASIC where the assembly language code is located, while `USR` actually transfers control to the assembly language subroutine. The assembly language subroutine must always end with an RTS instruction, a ReTurn from Subroutine. The RTS acts just as a BASIC statement does, returning control back to the BASIC statement after the `USR`. The typical call to our yet-uncoded sound subroutine would look like this:

```
110 DEFUSR0 = &H3E08  done only
    once in BASIC
    .
    .
330 A = USR0(0)  'call assembly
    language sub
340 . . .              'return here
```

The dots between statements 110 and 2100 represent other BASIC statements that are executed. One thing that must be done before the subroutine is executed, of course, is to set up a table of data in memory that the subroutine will use to generate sounds, or to point to the table if it already exists (such as the ROM sine wave table).

Where in Memory Will the Subroutine Be?

The `DEFUSR` statement defines where the assembly language subroutine is in memory. But just where should it be? There are many places it could be, but the overriding rule is to *put it out of the way of BASIC*. BASIC is constantly changing memory by adding variables, manipulating strings, and using a stack area, and any assembly language code must be put into an area that BASIC cannot touch.

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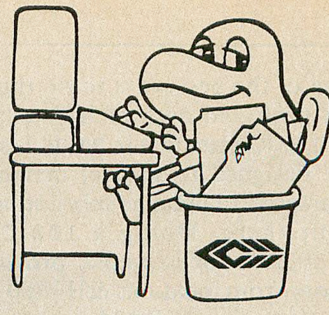

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One of the best ways to do this is to use a protected area of high memory. The CLEAR statement in BASIC is specifically designed to protect memory so that assembly language subroutines can be put there. Doing a `100 CLEAR 400,&H3DFF` for example, protects all memory from locations &H3E00 on up to the top of your RAM memory (512 bytes less than 16K to the top of memory). We'll use this area for the *Sound* program, and you might keep it in mind for your own programs. Of course, if you have a 64K system, you could use `100 CLEAR 400,&H7DFF`.

The 400 value, by the way, establishes the size of the BASIC string storage area. Use a larger value if you have many string manipulations in your program or if you have more than 64K.

How does the assembly language code actually get into the &H3E00 area? We could load it in by a LOADM (or CLOADM), but it's a real convenience for a short subroutine like this to encode it into BASIC DATA statements and include it in the BASIC program. That way we have everything in one neat little package. The DATA statements use values taken directly from the assembly language listing and look like this:

```
120 DATA &HXX, &HXX, . . . &HXX
121 DATA &HXX, &HXX, . . . &HXX
```

where the XXs stand for machine language values.

To move the machine language values in the DATA statements, a simple FOR/NEXT loop in BASIC is used:

```
140 FOR I = &H3E00 TO &H3E2A
150 READ ML
160 POKE I,ML
170 NEXT I
```

The skeleton form of our BASIC call now looks like this (including signal routine to the TV channel): See Figure 8.

Where's the Table?

The next question to resolve before actually coding the program is to determine where the table of data is to be and how to tell the assembly language program where it is. We mentioned before that we'd like to explore some of the areas of ROM to see what kinds of sounds could be generated from the relatively random data found there. For that reason, we can't just use a preassigned area of memory as a table. The table address, therefore, will not be fixed.

In addition to the table address, we have to consider how the other parameters will be passed to the assembly language program. The USR statement allows for passing one 16-bit parameter to the assembly language program. This would only take care of one parameter, though, and we have four — table start, table end, delay count, and repeat count.

There are a number of methods that can be used to pass more than one parameter, but we'll choose a simple one for this program — we'll put the parameters in memory right before the program at &H3E00. The assembly language program area will now look like Figure 9, a block of four parameters in eight bytes, followed by the (still) undefined assembly language code. The parameters can easily be poked into the &H3E00 area from BASIC, and we can change all of them at any time by doing a series of POKEs.

Coding the Program

Whew! We're finally at the point at which we can start coding the *Sound* program. Everything we've done up to this point has been program design. Generally, the more time spent in design, the fewer changes we'll have in coding and debugging the program.

Before coding this program, I gave some thought about what registers

Figure 8:

```
100 CLEAR 400,&H3DFF     'done at beginning of BASIC
110 DEFUSR0 = &H3E08     'done only once in BASIC
120 DATA &HXX, &HXX, ... &HXX  'machine language form
121 DATA &HXX, &HXX, ... &HXX  'of assembly language
140 FOR I = &H3E00 TO &H3E2A   'subroutine
150 READ ML              'move the machine language to
160 POKE I,ML            'the &H3E00 area - done once
170 NEXT I
180 POKE &HFF01,PEEK(&HFF01) AND &HF7  'select bit 0
190 POKE &HFF03,PEEK(&HFF03) AND &HF7  'select bit 1
200 POKE &HFF23,PEEK(&HFF23) OR 8      'set 6-bit sound
    .
    .
330 A = USR0(0)          'call assembly language sub
340 ...                  'return here
```

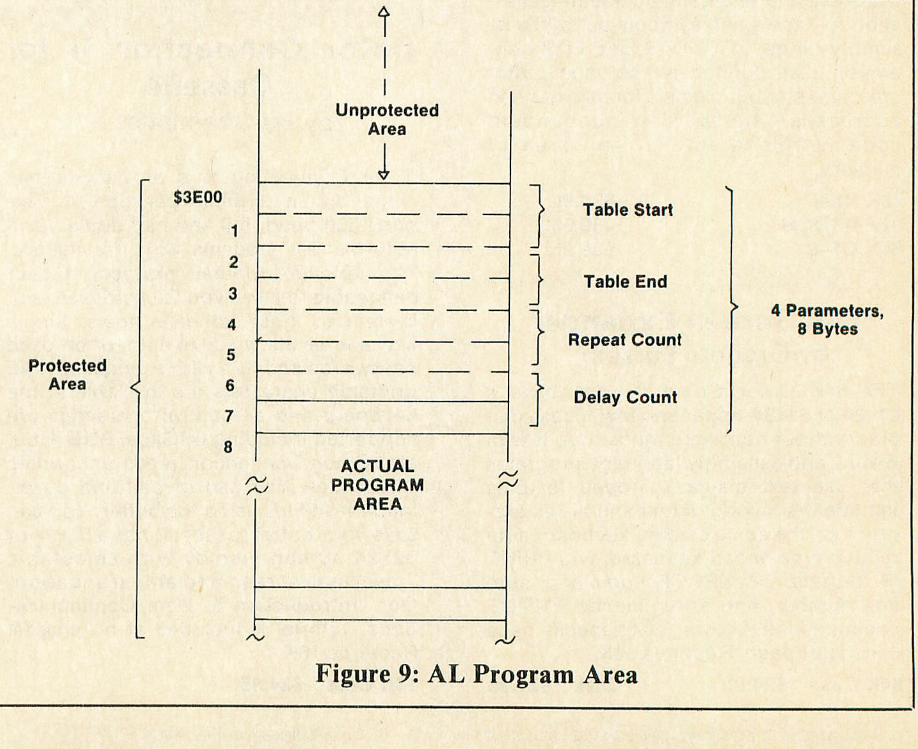

Figure 9: AL Program Area

could be used to hold the parameters. In such a short program, it is possible to dedicate registers for specific functions. In longer programs, of course, the registers can't be dedicated to any specific thing, but handle all kinds of tasks.

In *Sound*, the registers are set up this way:

- Register A is used as the main "working" register, holding the values to be sent to the DAC and other results.
- Register X holds the 16-bit delay count.
- Register U holds the table start initially, but is incremented by one to point to successively higher values in the table.
- Register Y holds the 16-bit repeat count.

Having as many things as possible in registers speeds up *Sound* considerably.

The complete listing of *Sound* is shown in Listing 1. Here's a short discussion of how it works. First, the repeat count is loaded into 'Y' from the parameter block (it's four bytes from the address in 'U'). This repeat count will be decremented down to zero through the program. When it reaches zero, the program has repeated the table values the number of times specified in the repeat count. Notice that this is a "Program Counter Relative" instruction that does not specify an absolute address. This and other instructions in *Sound* are relocatable, meaning that the machine language code can be moved anywhere in memory without having to reassemble the program.

Next, Register X is loaded with the delay count and Register U is loaded with the table address count from the parameter block.

The code in DAC020 and the next instruction is the innermost loop in the program. Before this loop, a DAC value has been output by the STA $FF20 and the delay count has been loaded into Register D from Register X by the TFR X,D instruction. The SUBD decrements this count and the BNE instruction causes a loop back to DAC020 while the count in 'D' is not equal to zero.

The code from DAC010 through five instructions from the end (BNE DAC010) is the next innermost loop. It makes a complete pass through the table of values, sending each value out to the DAC and delaying with the inner loop just discussed. The two LSLA instructions shift the data from the table to align it in the six high bits of 'A'. The table data is pointed to by 'U', which is used to load the data into 'A'. The LDA ,U+ also increments the pointer value in 'U' by one after the load is done. The CMPU BLK+2,PCR at the end of the loop continually compares the pointer value in 'U' to the end of the table value at two bytes from the parameter block start.

The outermost loop is from DAC005 through the BNE DAC005. It repeats a pass through the table values for the number of times equal to the repeat count. The repeat count in 'Y' is decremented by the LEAY -1,*Y* each time a complete set of table values has been sent out. When this value has been decremented down to zero, the BNE DAC005 is *not* done, and the program returns to BASIC by the RTS.

How to Use Sound

You can assemble *Sound* yourself, or simply use the BASIC version shown in Listing 2. The BASIC version will ask you for the Table Start value, Table End value, Repeat Count, and Delay. From here on in you're on your own as to what you specify for these parameters, but here are some suggestions:

To hear how your computer's memory data sounds, specify a start of zero and an end of &HFFFF with a repeat count of 1. You should vary the delay to get higher or lower frequencies as well.

Try the sine wave table at &HA85C through &HA87F to hear the sine wave used in the cassette output. (However, before you do, change Line 125 to read `125 DATA &H12,&H12,&HB7,&HFF` to change the LSLA instructions to "no operations." The sine wave table data is already aligned to the left, ready to be sent out to the DAC.) Specifying different delay counts will create higher and lower frequencies and specifying repeat counts of other than '1' will sound the sine wave for longer periods of time.

Try short sections of code repeated many times to create "real-world"

Listing 1: ***Sound*** **Program in Assembly Language**

```
3E00                00100          ORG     $3E00
3E00                00110 BLK      RMB     8           PARAMETER BLOCK
3E08 10AE 8C F8     00120 START    LDY     BLK+4,PCR GET REPEAT COUNT
3E0C AE   8C F7     00130          LDX     BLK+6,PCR GET DELAY COUNT
3E0F EE   8C EE     00140 DAC005   LDU     BLK,PCR      GET TABLE POINTER
3E12 A6   C0        00150 DAC010   LDA     ,U+            GET VALUE
3E14 48             00160          LSLA                   ALIGN TO 6 BITS LEFT
3E15 48             00170          LSLA                   BY TWO SHIFTS
3E16 B7   FF20      00180          STA     $FF20          SEND TO DAC
3E19 1F   10        00190          TFR     X,D            GET DELAY COUNT
3E1B 83   0001      00200 DAC020   SUBD    #1               DECREMENT BY ONE
3E1E 26   FB        00210          BNE     DAC020           GO IF NOT DOWN TO 0
3E20 11A3 8C DE     00220          CMPU    BLK+2,PCR      TEST FOR END
3E24 23   EC        00230          BLS     DAC010         GO IF NOT END OF TABLE
3E26 31   3F        00240          LEAY    -1,Y         DECR REPEAT COUNT BY ONE
3E28 26   E5        00250          BNE     DAC005       GO IF NOT DOWN TO 0
3E2A 39             00260          RTS               RETURN TO BASIC
          0000      00270          END
00000 TOTAL ERRORS
```

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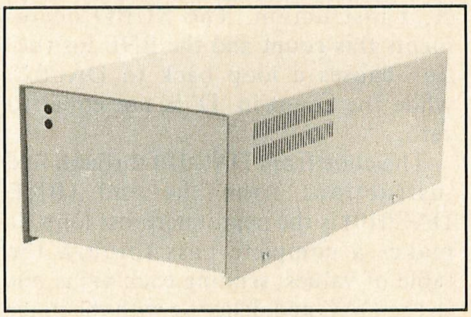

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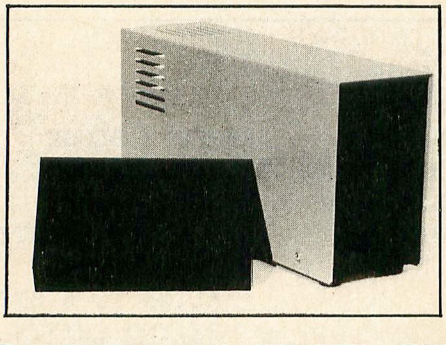

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```
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91  '*SOUND PROGRAM EXERCISER *
92  '*RELOCATES AND CALLS AL  *
93  '*SOUND PROGRAM.          *
94  '****************************

100 CLEAR 400,&H3DFF
110 DEFUSR0=&H3E08
120 DATA &H00,&H00,&H00,&H00
121 DATA &H00,&H00,&H00,&H00
122 DATA &H10,&HAE,&H8C,&HF8
123 DATA &HAE,&H8C,&HF7,&HEE
124 DATA &H8C,&HEE,&HA6,&HC0
125 DATA &H48,&H48,&HB7,&HFF
126 DATA &H20,&H1F,&H10,&H83
127 DATA &H00,&H01,&H26,&HFB
128 DATA &H11,&HA3,&H8C,&HDE
129 DATA &H23,&HEC,&H31,&H3F
130 DATA &H26,&HE5,&H39
140 FOR I=&H3E00 TO &H3E2A
150 READ ML
160 POKE I,ML
170 NEXT I
180 POKE &HFF01,PEEK(&HFF01) AND
    &HF7
190 POKE &HFF03,PEEK(&HFF03) AND
    &HF7
200 POKE &HFF23,PEEK(&HFF23) OR8
210 INPUT "TABLE START";TS
220 INPUT "TABLE END";TE
230 INPUT "REPEAT CNT";RC
240 INPUT "DELAY CNT";DC
250 POKE &H3E00,INT(TS/256)
260 POKE &H3E01,TS-INT(TS/256)*
    256
270 POKE &H3E02,INT(TE/256)
280 POKE &H3E03,TE-INT(TE/256)*
    256
290 POKE &H3E04,INT(RC/256)
300 POKE &H3E05,RC-INT(RC/256)*
    256
310 POKE &H3E06,INT(DC/256)
320 POKE &H3E07,DC-INT(DC/256)*
    256
330 A=USR0(0)
340 GOTO 210
```

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noises like car crashes, phaser blasts, and the like.

Constructing Your Own Sound Tables

Just as the sine wave table provides a sine wave sound output, you can construct your own tables of sounds. There's plenty of room to do this in the area beyond the end of the program at &H3E2B through &H3FFF. `POKE` the values by `DATA` statements and `READ` loops just as in moving the machine language code. Some suggestions with parameters are shown in Figure 10.

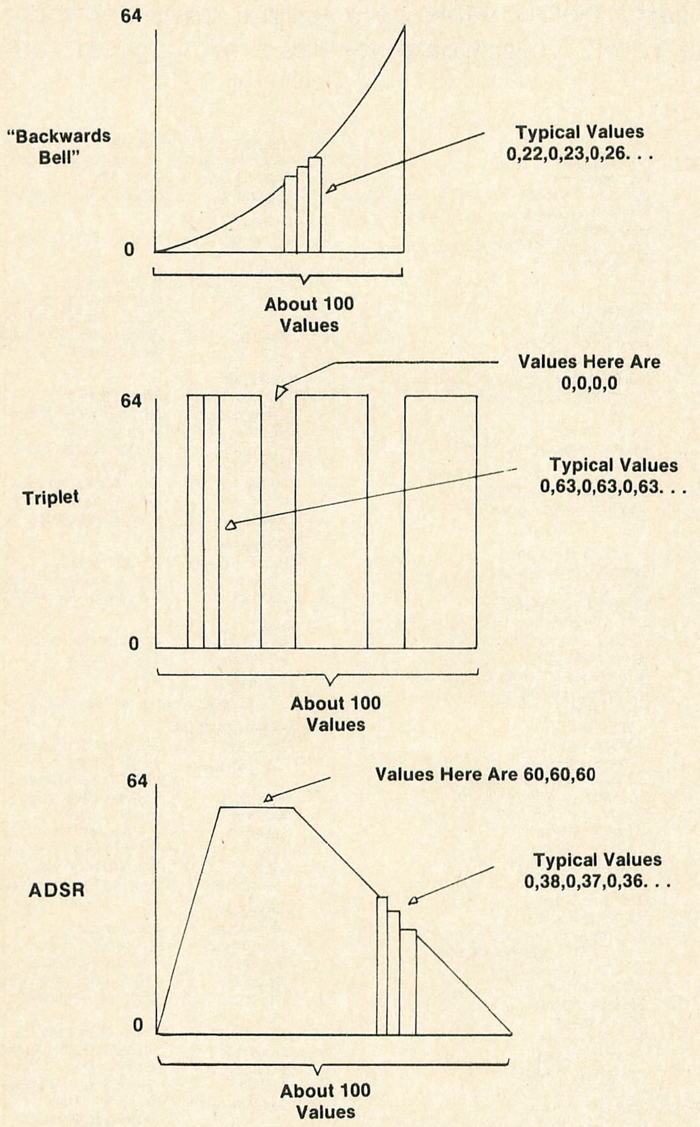

Figure 10: Sound Table Shapes

By using many tables of sounds, you can create an entire set of sounds to use for synthesized music, games and other functions. Remember that the *Sound* table location can be changed at will by `POKE`ing the proper addresses into the $3E00 parameter block. The BASIC program shown above is really only a guide to how to interface to *Sound* — it should be easy for you to incorporate *Sound* into your own BASIC code.

Sound Contest

I would be very interested in the results you obtain with this program and I'd like to hear about unique areas of memory that yield good sound effects, or tables of sounds you've created. As a matter of fact, let's make it a contest! Entries can use the sound program here or your own version of a sound driver. Send your best sound effect, ready to be run with a `LOADM/EXEC` (or `CLOADM/EXEC`). The winner of the most unique sound will be awarded a copy of my Howard W. Sams book *TRS-80 Model I, II, and Color Computer Interfacing Projects* (which, by the way, describes more sound projects) and a one year's subscription to RAINBOW. The winner and runner-up entries will be featured in this column. Send entries to me at P. O. Box 3568, Mission Viejo, CA 92692. (I can also be contacted in the CoCo SIG on Delphi. Username is BILLBARDEN.) The contest deadline will be the last day of the month in which this column appears in THE RAINBOW.

'Til I see you here next month with more assembly language topics, keep assemblin'!

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Challenger 80
Cinsoft 74
CNR Engineering 228
CoCo Warehouse 42
Cognitec 13
Colorware 169, 170, 171, 172
Computer Center 35
Computer Friends 225
Computer Island 136, 137
Computer Plus 3
Computerware 99, 245, 247
Computize, Inc. 218, 257
Cosmos Computer Services Inc. 140
Cost Plus Electronics 233
Custom Computer Products 16
Dayton Associates of
W. R. Hall, Inc. 178
Delphi 242, 243
Derringer Software 86, 87
Didaktek 51
Diecom 143
Disto .... IBC
Dorsett Educational Systems 193
Dragon User 155
DYNACALC 93
Dynamic Electronics, Inc. 91
E.D.C. Industries 223
Eli Heffron 189
Elite Software 45, 46, 47
Federal Hill Software 78
Four Star Software 121
H.D.R. Software 188
Hard Drive Specialists .... IFC
Hawkes Research Services 196
Hazelwood Computer 200
HJL div. of Touchstone
Technology, Inc. 130
Frank Hogg Laboratory 227, 229, 231
Homesoft 72, 202
Howard Medical 33, 34, 258
Incentive Software 89
Inovative Systems 103
J & M Systems .... BC
J & R Electronics 138
Johnson, D.P. 253
JTJ Enterprises 73
Kelly Software Distributors 197
LR Tech 252
Mark Data Products 37, 182, 183
Metric Industries 156
MichTron 38, 224
Micro Data Systems 73
Micro Works, The 232
Microcom Software 17
Microtech Consultants Inc. 94
Mix, Tom Software 118, 119
Moreton Bay 146
Novasoft 162
Other Guys Software, The 65
Owls Nest Software 43
Owl-Ware 82, 83
PCM 100
PD Software 230
Perry Computers 97
Polygon Co. 70
Dr. Preble's Programs 124
Prickly-Pear Software 144
PXE Computing 1
Radio Shack 9, 11, 186, 18
Rainbow Adventure Book 4
Rainbow Binder 24
Rainbow Bookshelf 22
RAINBOWfest 234, 23
Rainbow Gift Subscription 19
Rainbow Guide to OS-9 5
Rainbow On Tape 13
REM Industries 2
Roberson, S.D. 20
Robotic Microsystems 16
Saguaro Software 7
Selected Software 19
Software House, The 14
Software Support, Inc. 250, 25
Spectrosystems 23
Spectrum Projects Inc. 105, 106, 107
110, 111, 113
Speech Systems 54-6
Sugar Software 204, 20
Sunrise Software 20
T & D Software 14
TCE Programs, Inc. 1
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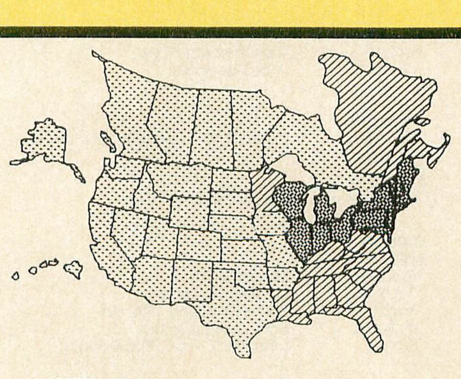

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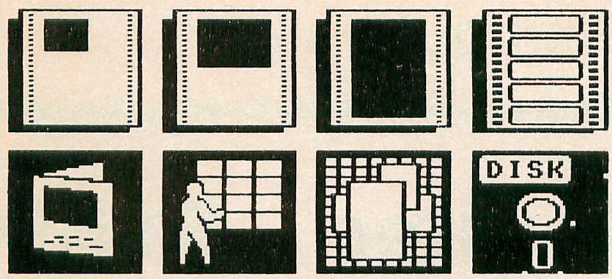
THE ULTIMATE PRINTER UTILITY



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HARDCOPY - Hardcopy is more than just a screen print dump, compare these features with any other graphic dump program on the market:

- Full GRAPHICOM/GRAPHICOM PART II compatibility! Loads STANDARD 6K images, GRAPHICOM pictures, and COCO MAX pictures too!
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- **GRAPHIC LABELS** - The label printing option allows the user to create custom mailing or disk labels with professional looking results.
- **GREETING CARDS** - The greeting card option allows the user to custom design greeting cards using both text and graphics.
- **GIANT POSTERS** - The poster option provides the user with a means of reproducing a hi-res graphic to a multi-sheet poster.
- **SPECIAL EFFECTS** - The special effects option allows the user to directly control the printing directives; ROTATION, X/Y SIZE, X/Y FLIP, X/Y GRID, X/Y FILL, TAB, WINDOW, POS/NEG IMAGE, and more!
- **USER CALL** - Have an application that **HARDCOPY** doesn't quite match? **HARDCOPY** routines can be added to EXTENDED BASIC through the USR command!

HARDCOPY* requires a 64K Color Computer or Color Computer II, and at least one disk drive.It supports 1 to 4 disk drives, keyboard or joystick input. Please specify printer and cat. number when ordering.
*** Due to hardware differences, some features may function differently on certain printers.**

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AINT
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RAPHICOM PART II DOES NOT REQUIRE GRAPHICOM TO RUN!

raphicom Part II requires a 64K extended disk basic system, and supports 1 to 4 disk drives, keyboard or ystick (analog or switch type) input. It will load and save both **Standard BIN** files and **Graphicom** screens. ll functions support color or Hi-Res operation, as well as the 4 screen display modes.

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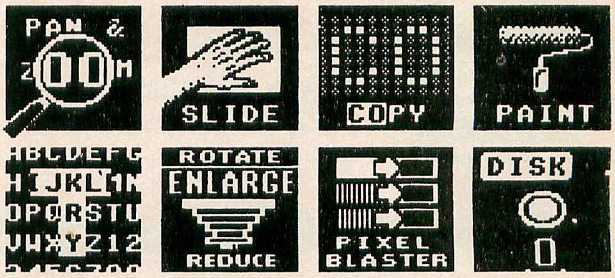

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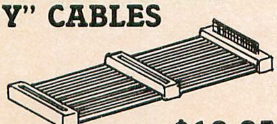

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- 4 page animation mode
- Color Palette with over 15 color patterns for use with Hi-Res artifact
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- Supplied utility for transferring Graphicom screens to Basic or other M/L programs.
- Supplied utility for loading screens from Basic or other sources
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- Many additional features, operating hints, hardware mod's and suggestions, etc.

REQUIRES 64K COCO, 1 DISK DRIVE, AND 2 ANALOG JOYSTICKS

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- Same as 131 except No RGB
- With 90 day Zenith warranty
- **Monitors require video controller See page 34**

NEW
40 COLUMN

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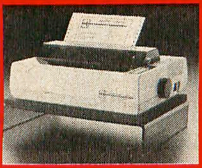

- Friction and tractor 80 column
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80 COLUMN

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- Single switch lets you switch from J DOS to RS DOS
- Gold contacts & data separator
- New serial port so you don't need a serial interface for a parallel printer

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- ROM chip makes J&M compatible
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- Release 1.1

Howard Medical Computers

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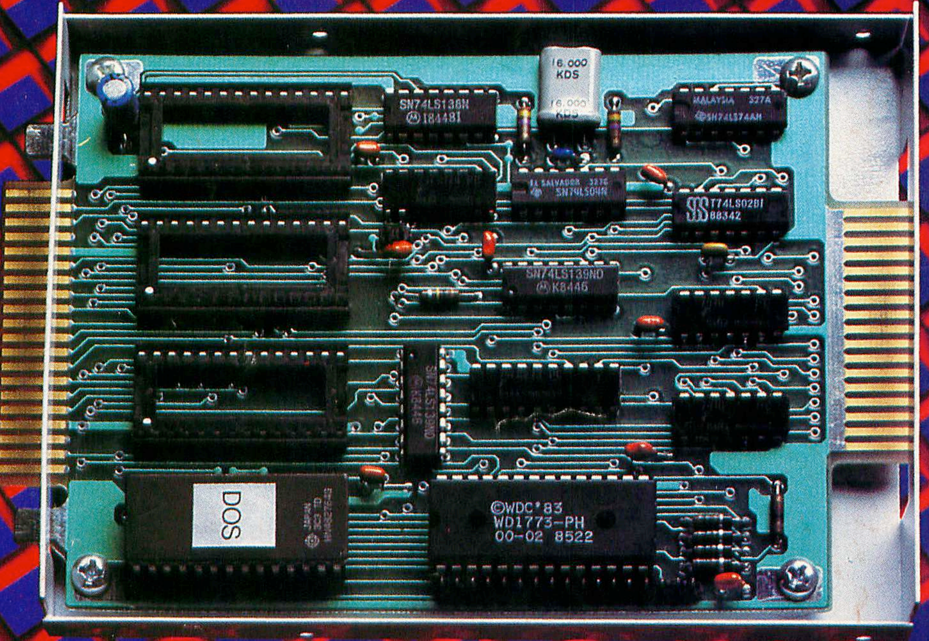
SUPER CONTROLLER

ONLY $99.95 US.



FEATURES:

- Gold contacts on all connectors.
- Shielded metal box for low RF noise.
- 4 28-pin sockets for software expandability.
- Uses 2764 or 27128 EPROMS.
- EPROMS are software selectable.
- Internal Mini-Expansion Bus interface for;
  - 80 Columns
  - Real Time Clock and/or
  - Parallel Printer or
  - EPROM Programmer or
  - User Projects.
- Complete Radio Shack compatibility.
- New technology, no adjustments needed.
- Very Accurate 16mhz High Speed Master Clock.
- Needs +5 volts only, works on all COCOs or COCO IIs.

EXPANSION ADD-ONS:

There are currently four add-ons available from DISTO for this controller;

PPRINT
The first is a Centronics Compatible Parallel Printer adapter. This adapter will allow you to connect a Centronics compatible printer directly to your controller, leaving the serial port of your computer free for your modem. Printer driver software included.

RTIME
The second is a Real Time Clock. This is a clock chip that will keep the proper time, date and year. A small battery keeps the time when the Computer is off, retreive and set the time by using simple Basic POKES. Also available with the Real Time Clock is the optional Centronics Compatible Parallel Printer adapter. Software to set the clock and printer driver included.

MPROM
The third is a Mini EPROM Programmer. Yes, a low cost programmer that attaches to the disk controller. A must for the DISTO Super Controller. Program those often used utilities into EPROM and plug them directly into your controller. Will program 2764's or 27128's, a perfect mate for the DISTO Super Controller.

DISPLAY80
The fourth is a real knock-out. This is a three in one card. It's major function is to add an 80* 24 display to your computer. A feature packed package also includes RTIME and PPRINT. All in one neat package that fits inside the controller. OS9 software available. Call for more information.

CREDITS:
The DISTO Super Controller, add-ons and all its documentation are conceived and designed by Tony Distefano. The DISTO Super Controller and add-ons are manufactured and distributed by; C.R.C. COMPUTER INC.
10802 Lajeunesse, Montréal, Québec, Canada H3L 2E8 1-514-383-5293

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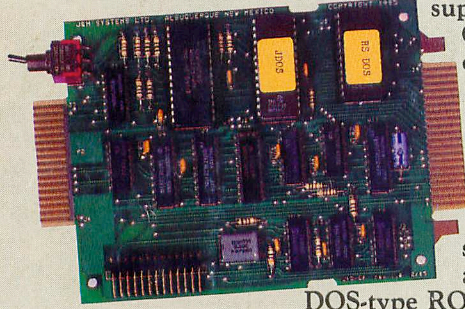
5¼" 5 MByte full size	$495
5¼" 10 MByte ½ size	$650
3½" 20 MByte (shown above)	$795

JFD-CP DISK CONTROLLER

Our new JFD-CP, compatible with both the original COCO and the COCO 2, features a parallel port to support a Centronics compatible printer or our hard drive, and an external ROM switch, which allows you to select JDOS or an optional RS DOS-type ROM. It comes in a case and includes JDOS 1.2 and manual. JDOS implements all RS DOS commands, plus many more, including auto line numbering, error trapping, baud rate selection, OS/9* boot from floppy or hard drive, and Memory Minder**, our disk drive analysis program (Precision Alignment Disk not included).



JFD-CP Disk Controller with JDOS	$139

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Our old JFD-COCO controller remains a strong seller. Some people just like old "classics" best! So we have brought it back at the lowest price ever!

JFD-COCO Disk Controller with JDOS	$99

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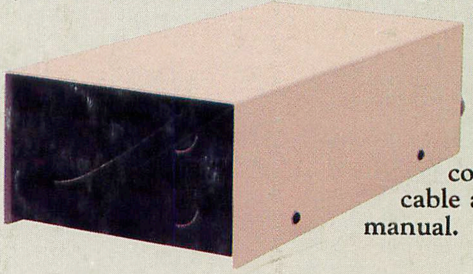
Upgrade your Color Computer by adding our new JFD-CP disk controller, supercharged with JDOS 1.2 operating system, and a top quality drive with case and power supply. Comes complete with cable and JDOS manual.



Drive 0 System with one single side drive	$279
Drive 0 System with one double side drive	$349
Drive 0,1 System with two single side drives	$389
Drive 0,1 System with two double side drives	$489

MEMORY MINDER**

memory minder
A DISK DRIVE ANALYZER
Dysan
DDD

Memory Minder is a disk drive test program now included in JDOS. Used with a Precision Alignment Disk, Memory Minder allows you to check your drives for speed, alignment, sensitivity, hysteresis, and more! You can actually align or adjust the drives while viewing the graphics on the screen. No special equipment needed!

PRECISION ALIGNMENT DISKS (From Dysan)

PAD-40X1: Tests single side disk drives	$26
PAD-40X2: Tests double/single disk drives	$33

Memory Minder is available on diskette for those who don't own a JFD-CP controller with JDOS. Includes Precision Alignment disk.

Memory Minder: single side package	$59
Memory Minder: single/double side package	$75

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